CANADIAN MACHINERY AND MANUFACTURING NEWS

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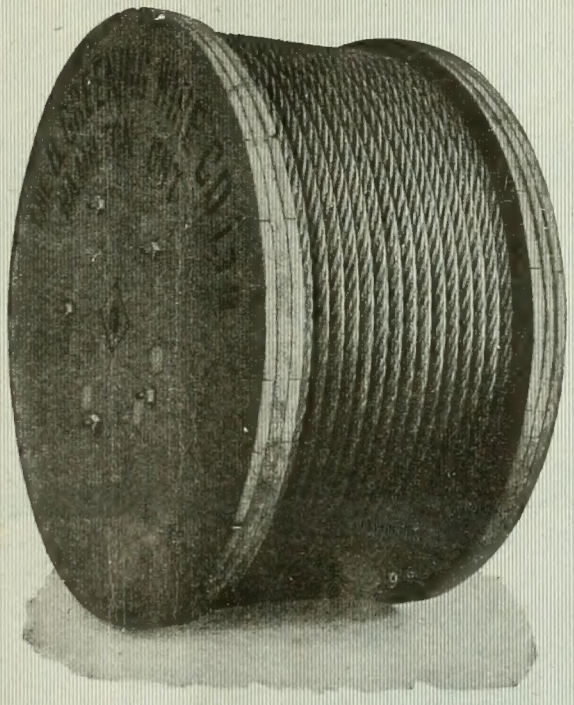
WIRE ROPES



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These reamers have eccentric relief and can be set to size without regrinding. They are unexcelled for design and simplicity and ease of adjustment.

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The BERTRAM Page

MACHINE TOOLS

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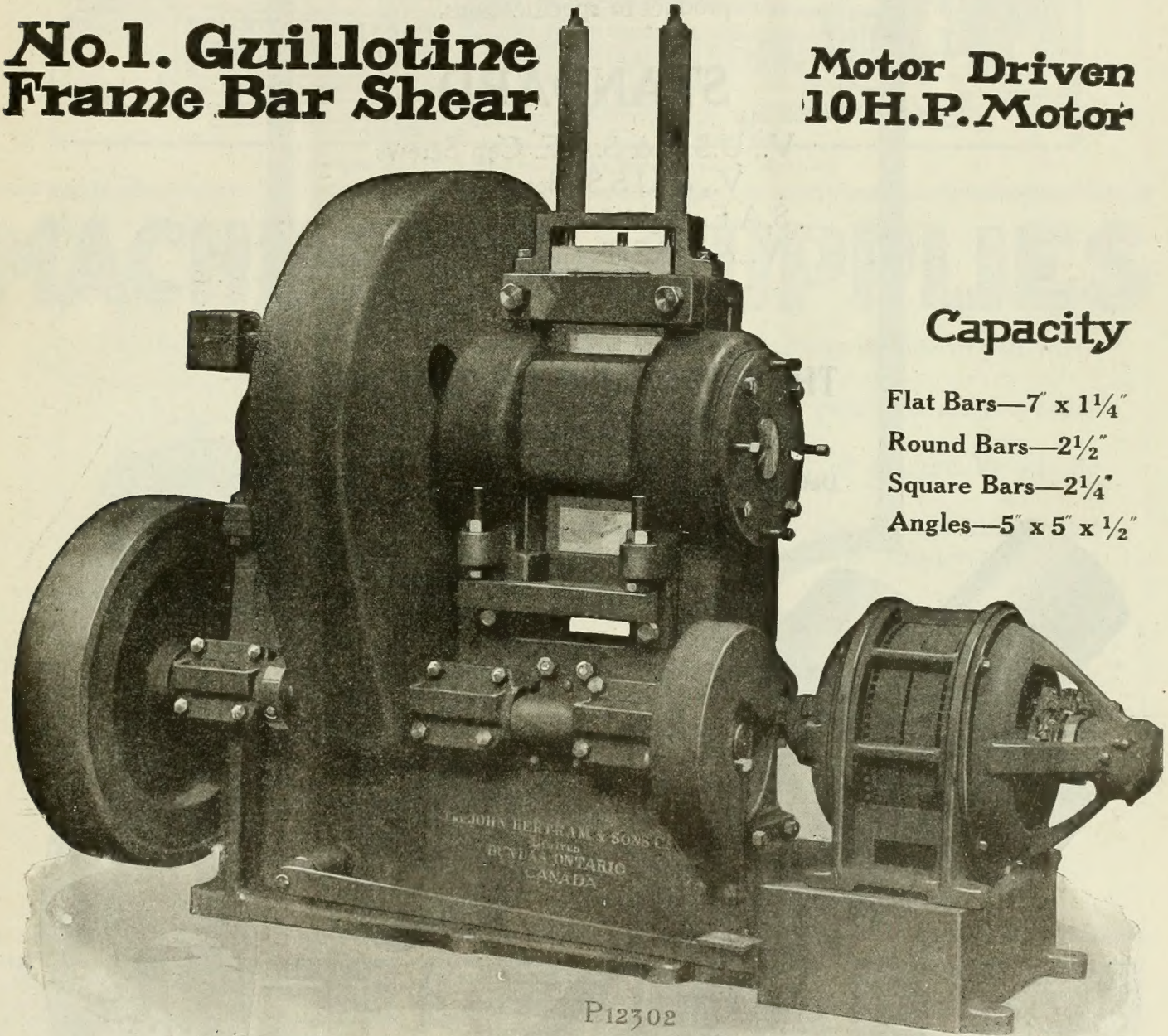
No.1. Guillotine Frame Bar Shear

Motor Driven 10H.P. Motor



Capacity

Flat Bars—7″ x 1¼″
Round Bars—2½″
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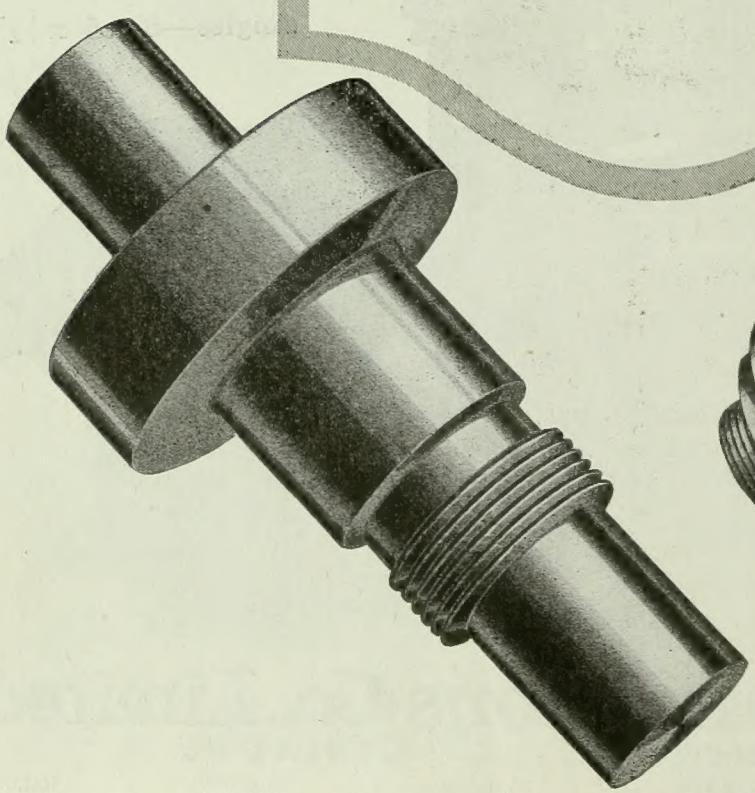

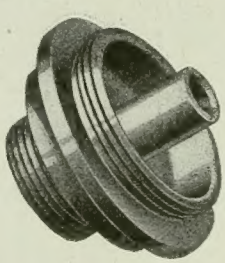

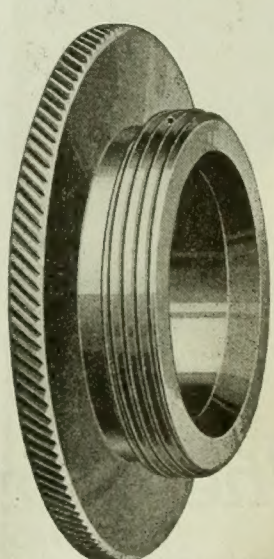

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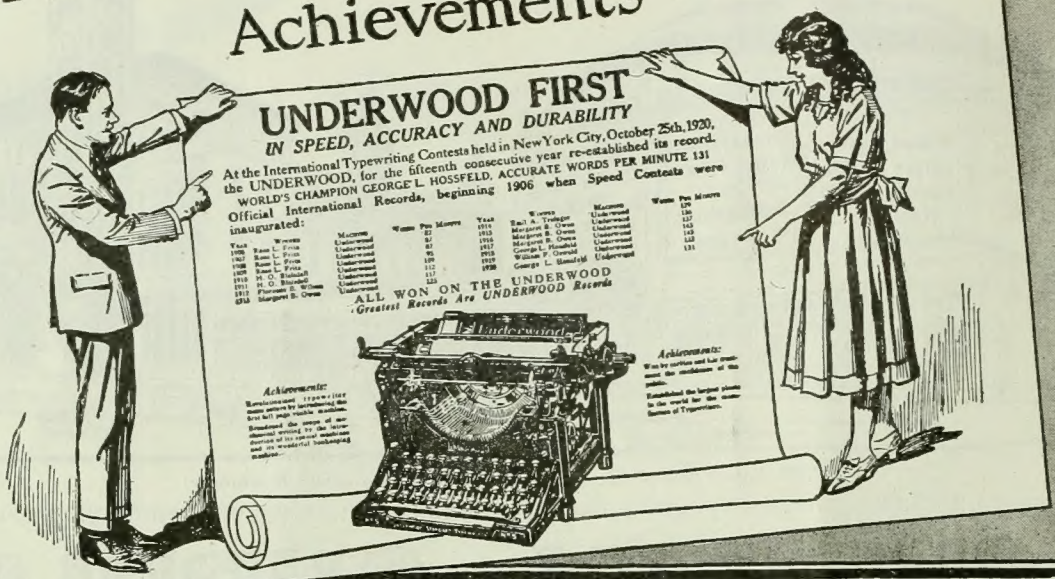

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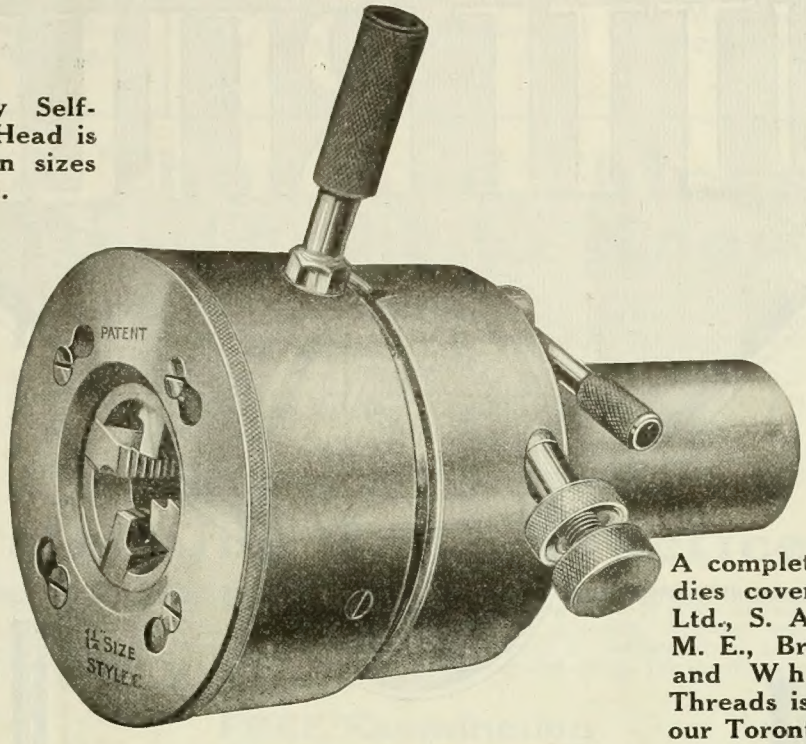

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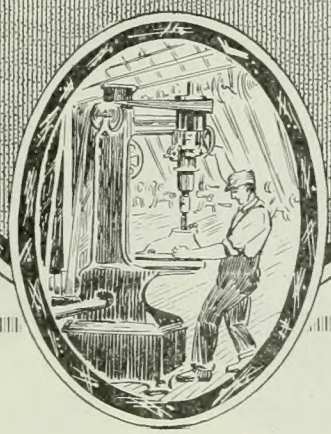

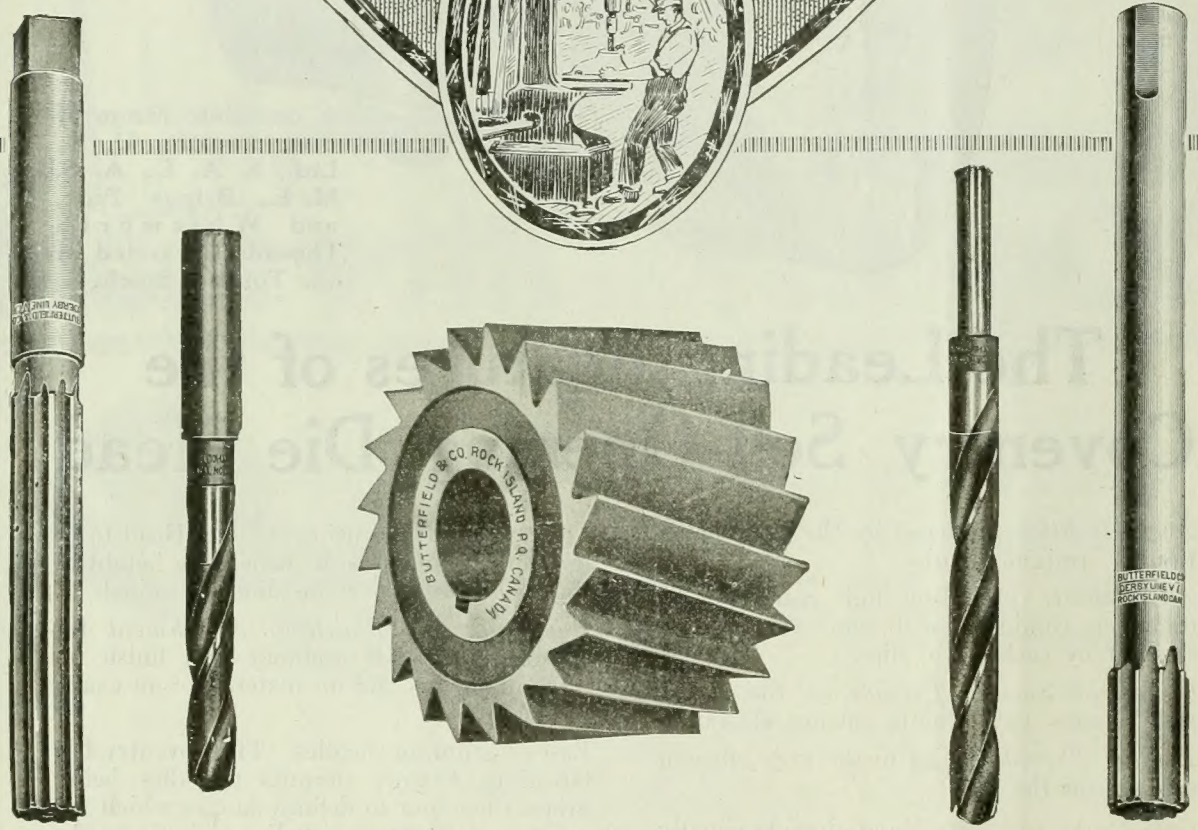

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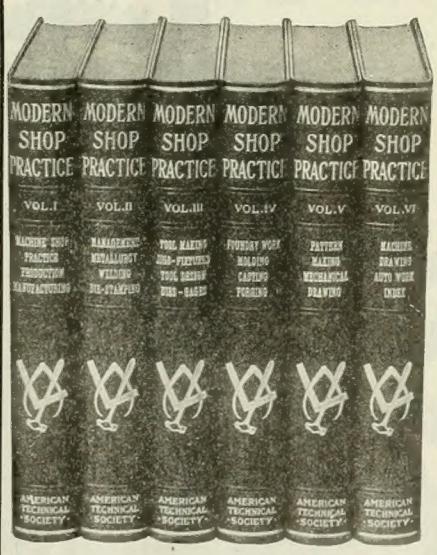

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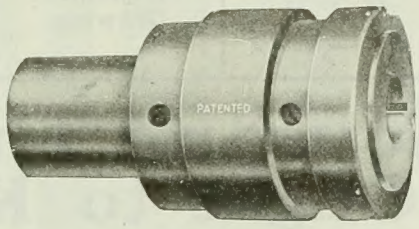

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you are looking for the machine with the highest rate of production, the smallest amount of lost time, and the longest life. In all probability you will find that machine equipped with a Johnson Clutch, for the Johnson Clutch not only gives best service, but adds greatly to the convenience and speed of operation.

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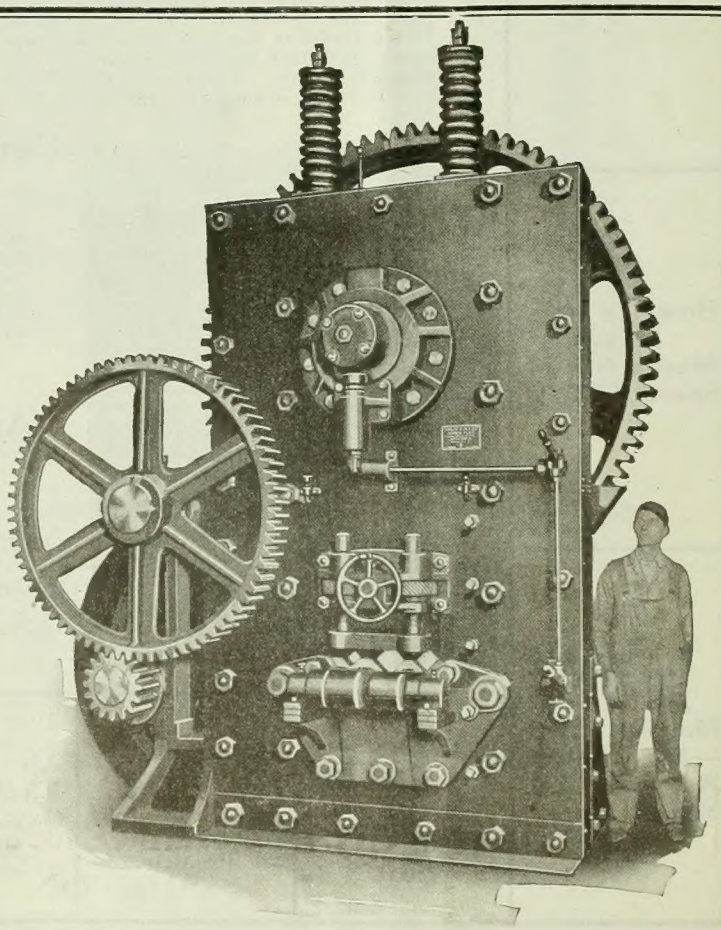

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Send Us Your Enquiries.

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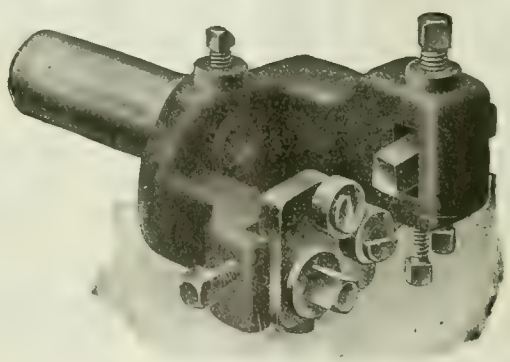

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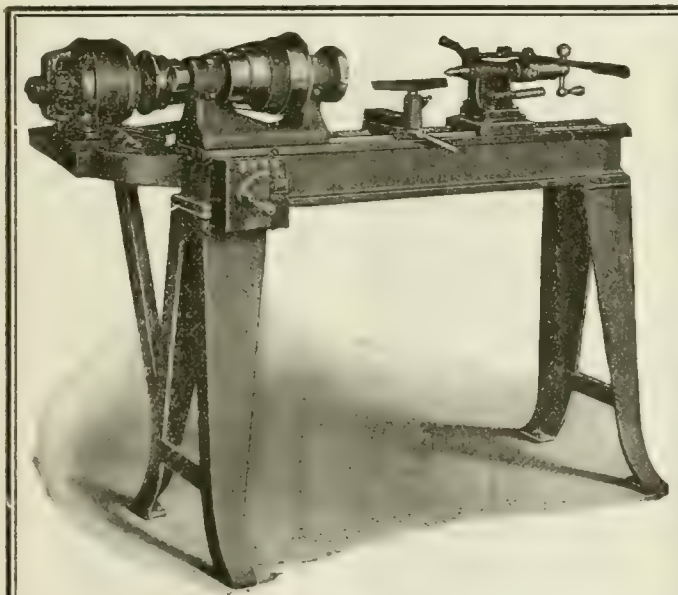

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LARGE STOCK FOR PROMPT DELIVERY

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SPEEDICUT *High Speed Steel*

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Send for a Murchey Tap and Die on approval.

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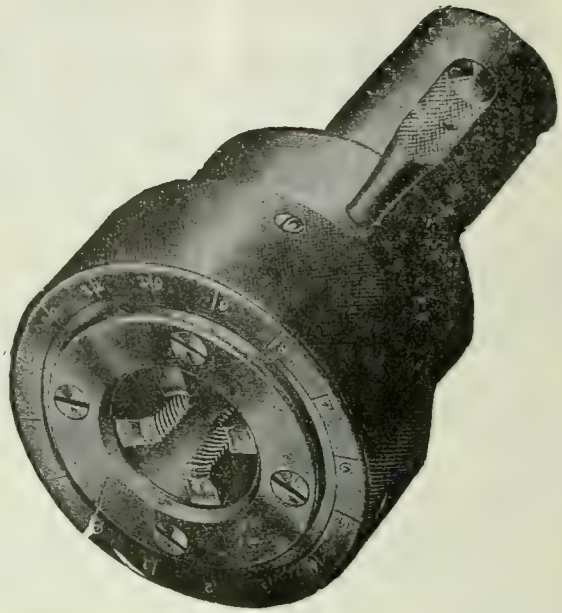

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For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

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Regulators *Torches for Every Purpose* *Generators*

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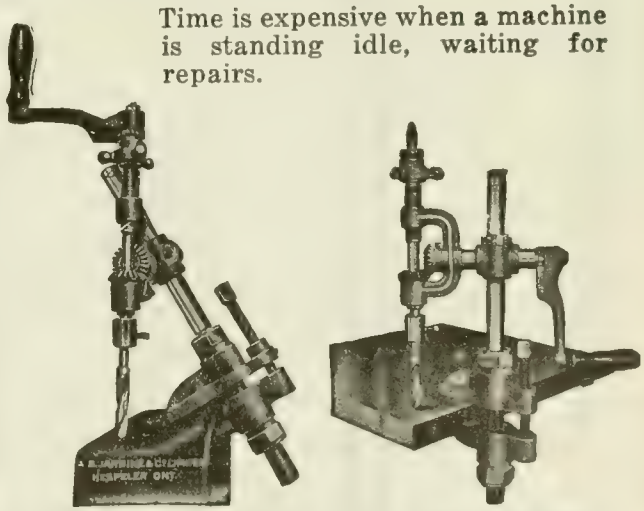
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses.

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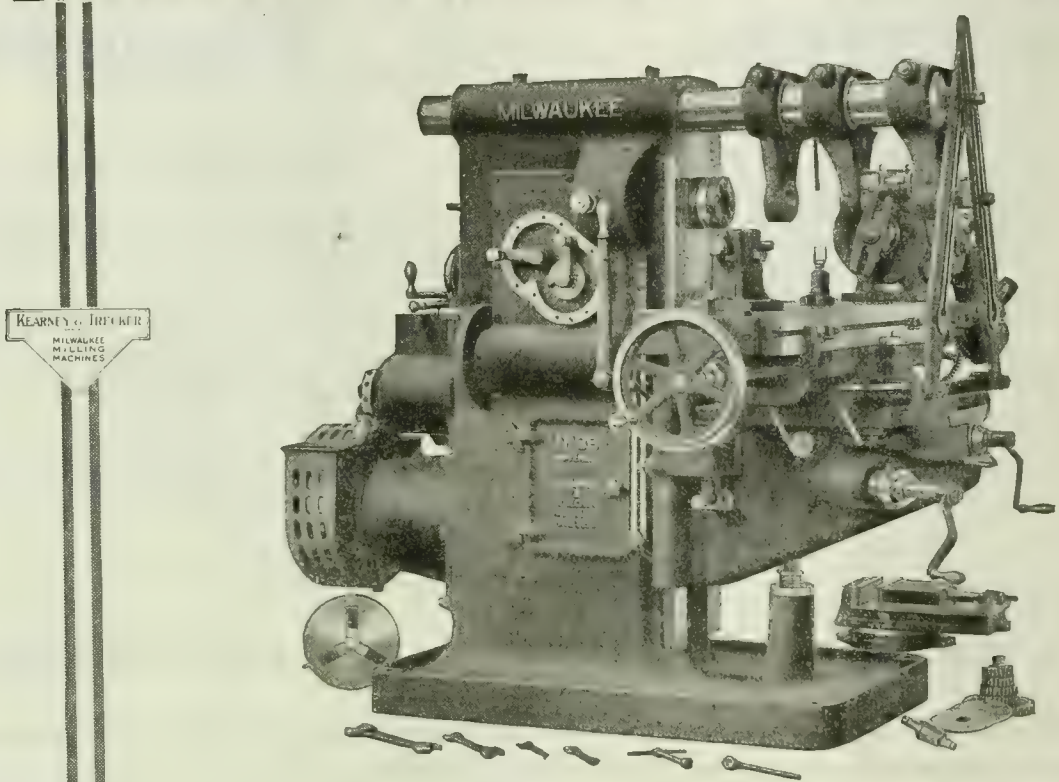

Distinctive Tool-Room Milling Machines

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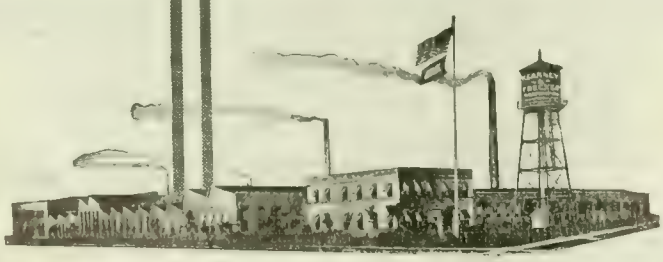

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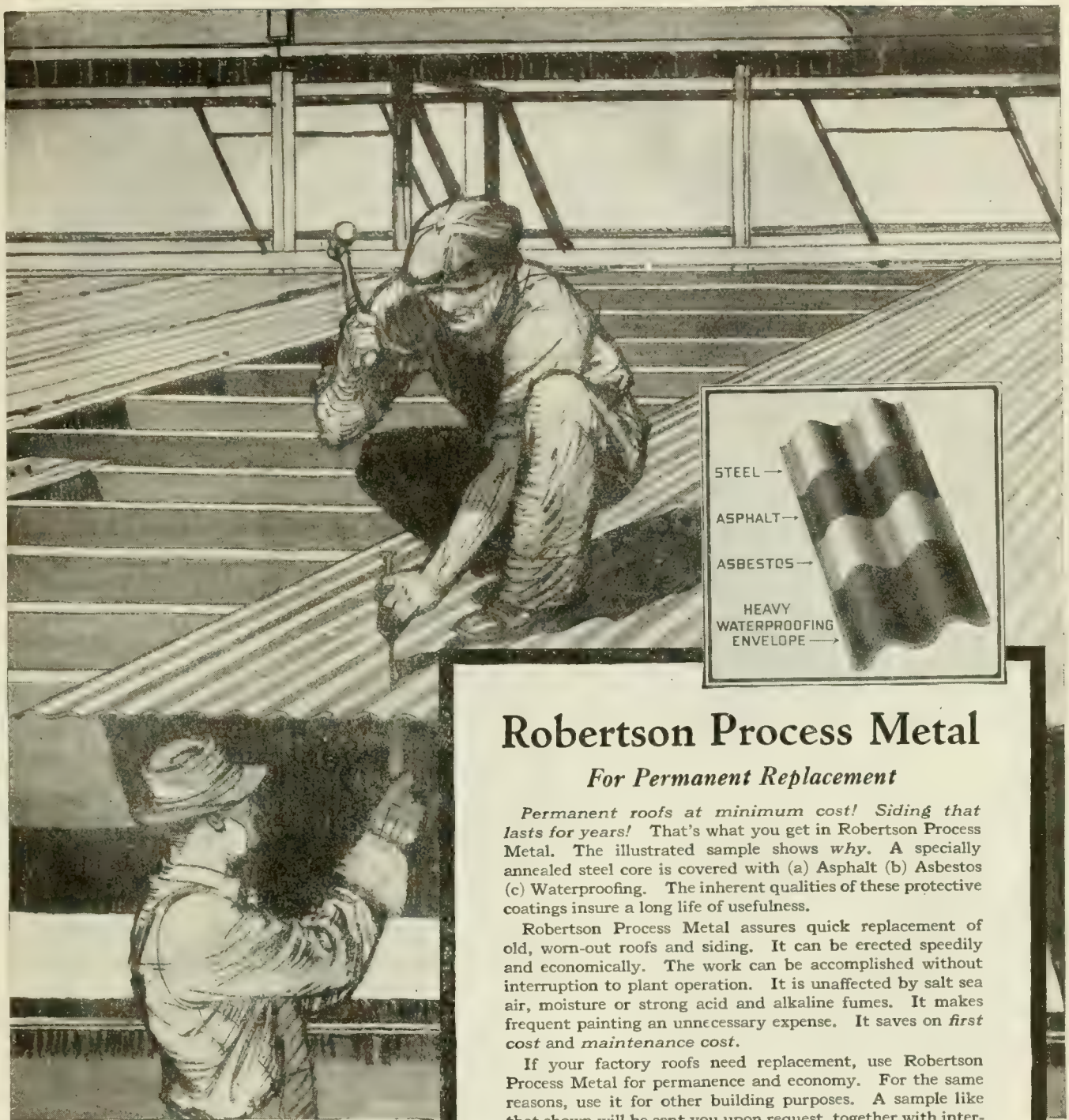

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METAL FOR ROOFING AND SIDING

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As no distribution pipes or ducts are required, installation cost is 15 to 50% less than any other system. Power consumption is only 20% of the capacity of power units supplied with the average installation. Maintenance costs are lower because of the compactness and centralized design of the heating coil. No special foundation required other than provided by ordinary floor construction. Requires less floor space than any known system, and is easily installed by common labor. Is portable in the fullest sense of the word and can therefore be easily relocated in any part of the plant.

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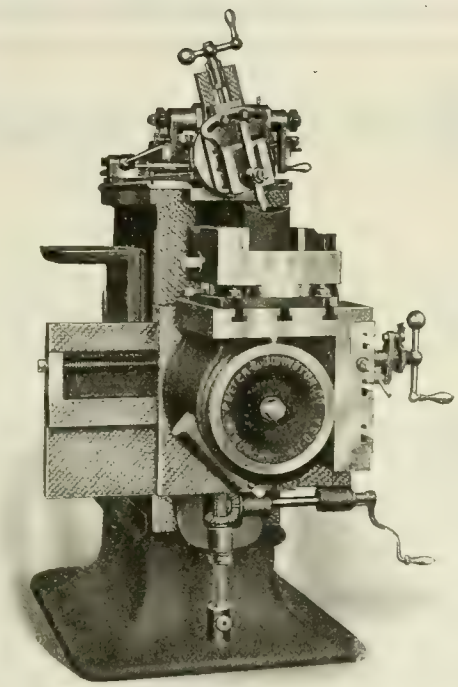

15" Type

Swivel table with auxiliary tilting side.

Power down feed on any angle.

Automatic feed stop.

Graduated collars on tool head feed screw and table feed screw.

Swivel vise with graduated base.

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No special vises or fixtures needed; the Universal features of these machines take care of everything, making them particularly adapted to:—

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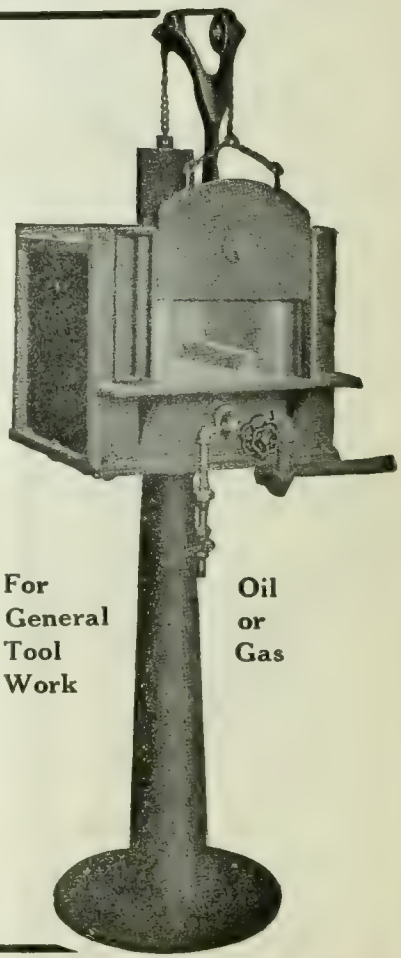

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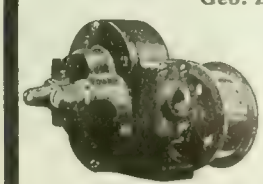

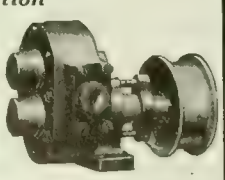

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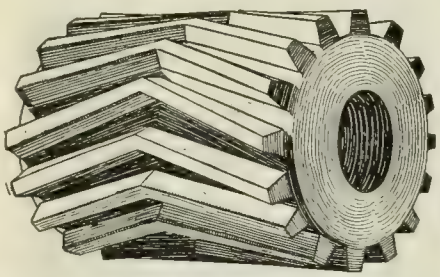

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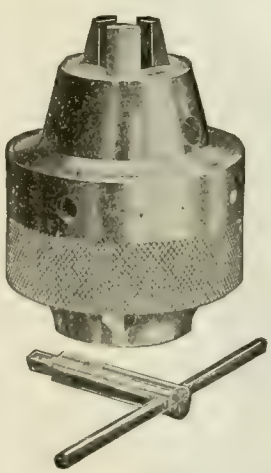

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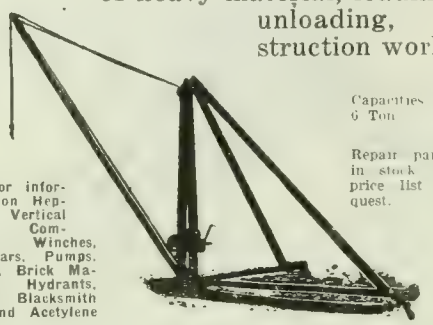

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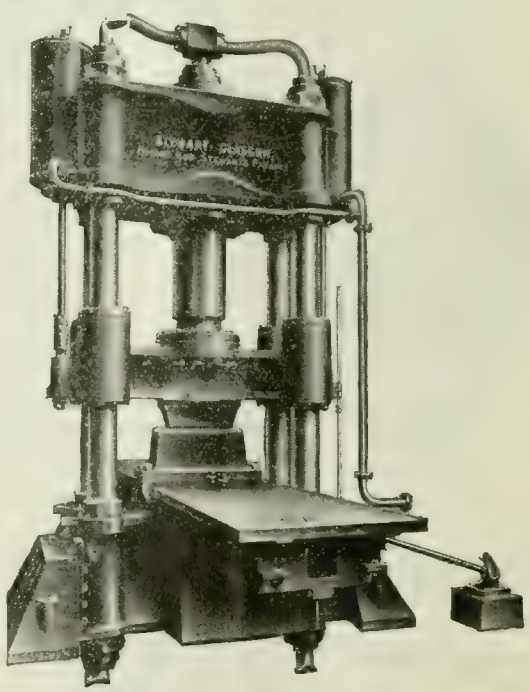

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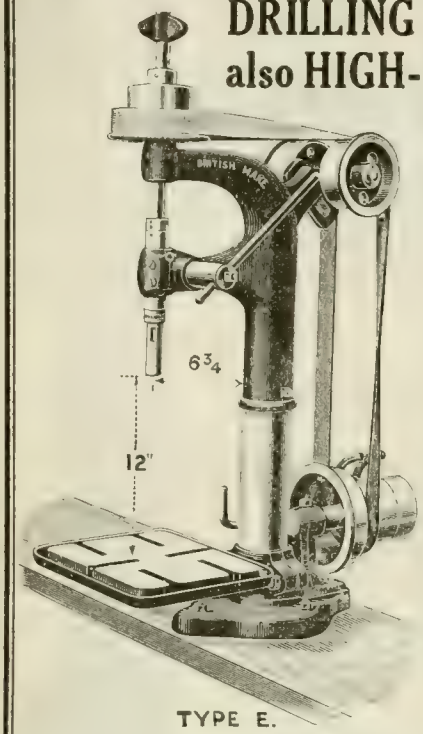

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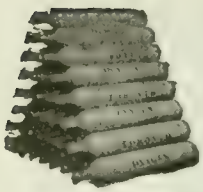

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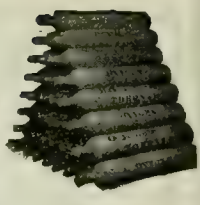

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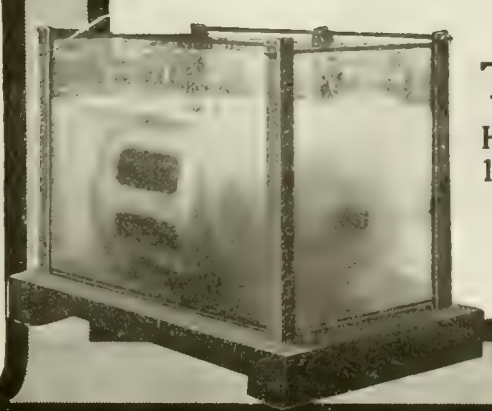

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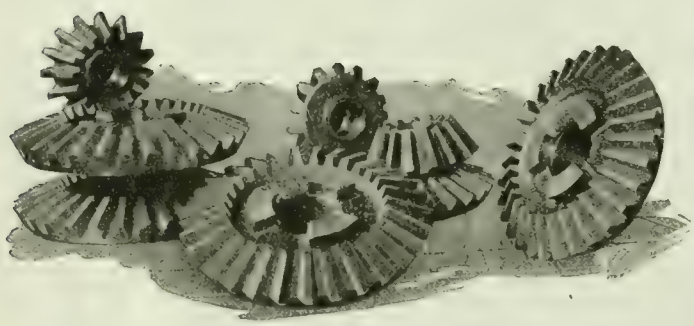

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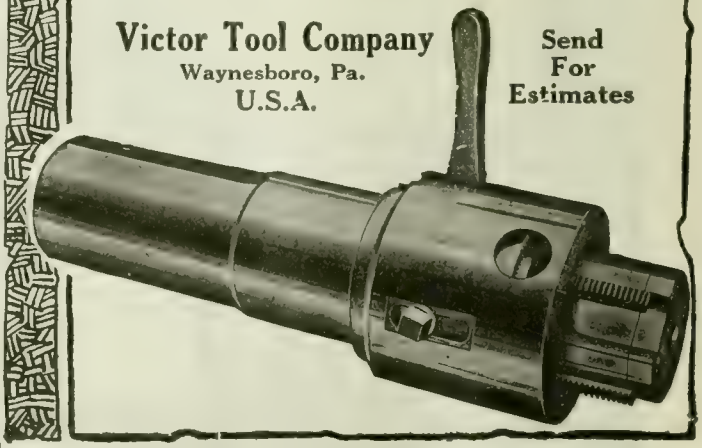

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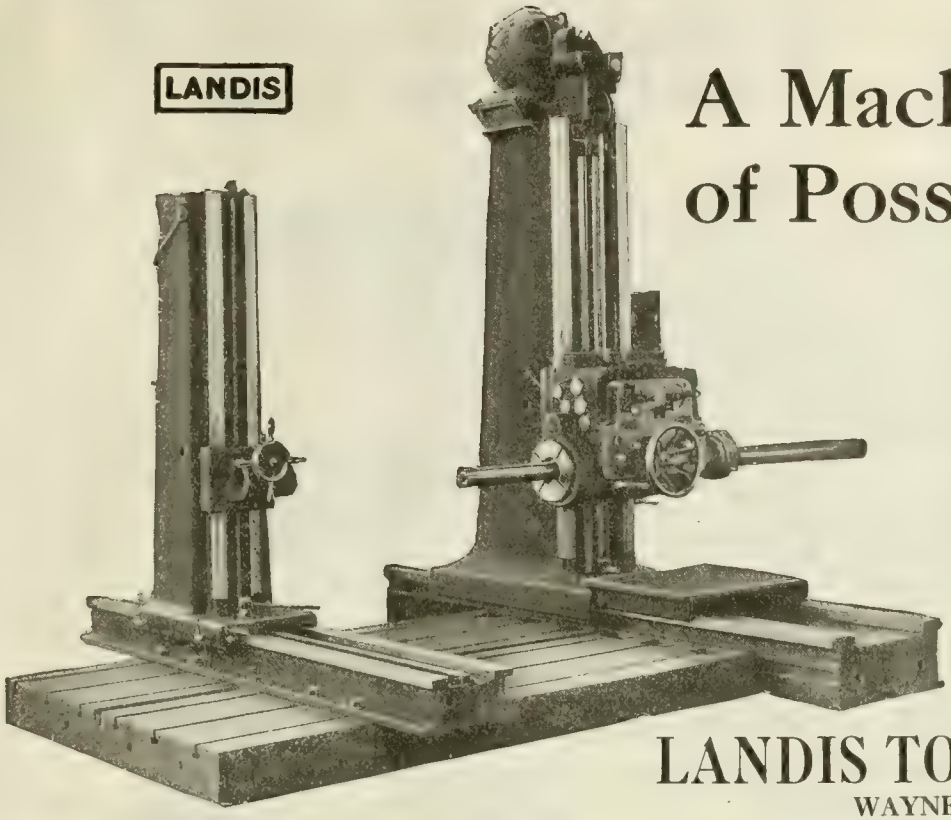

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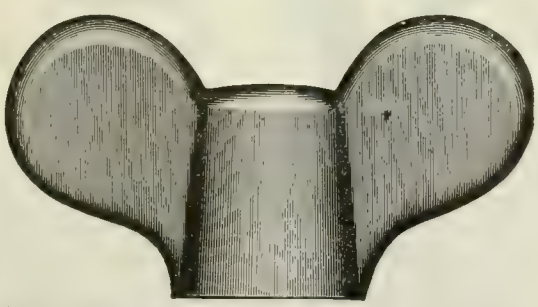

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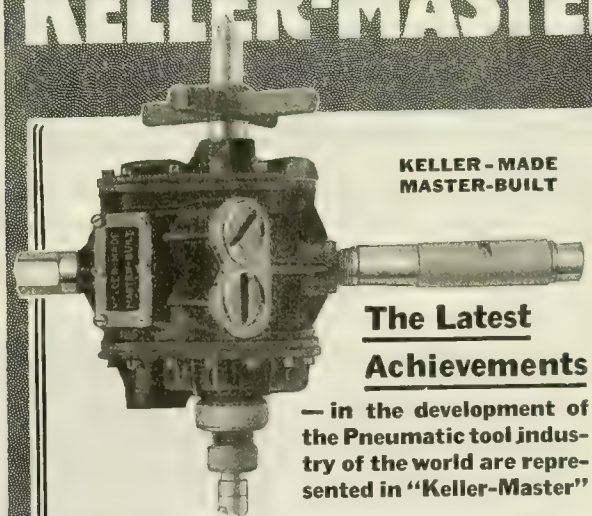

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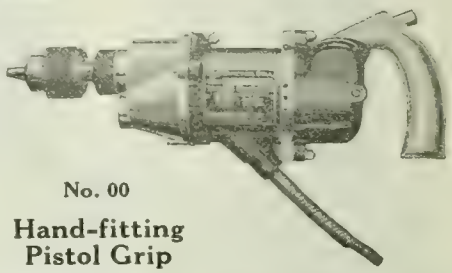

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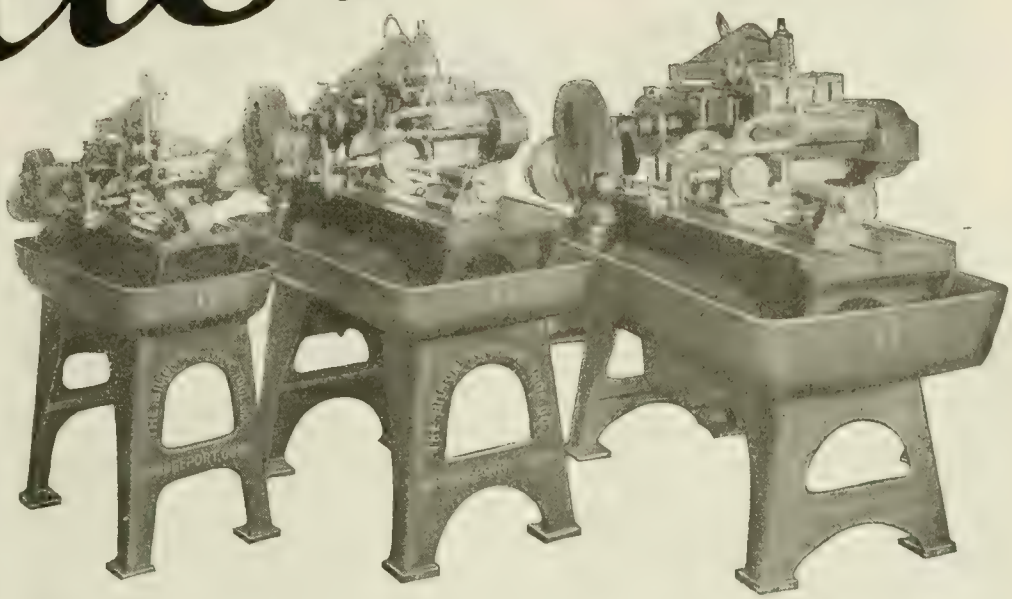

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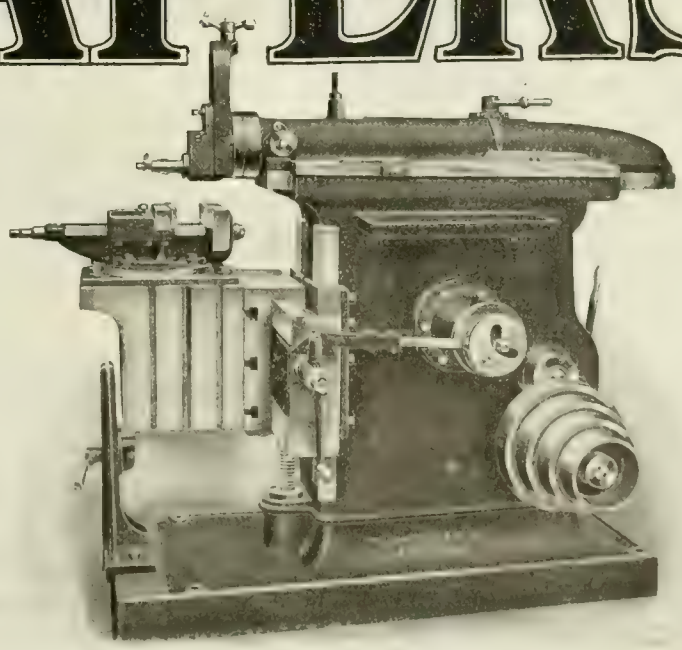

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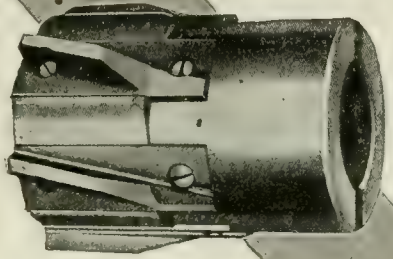

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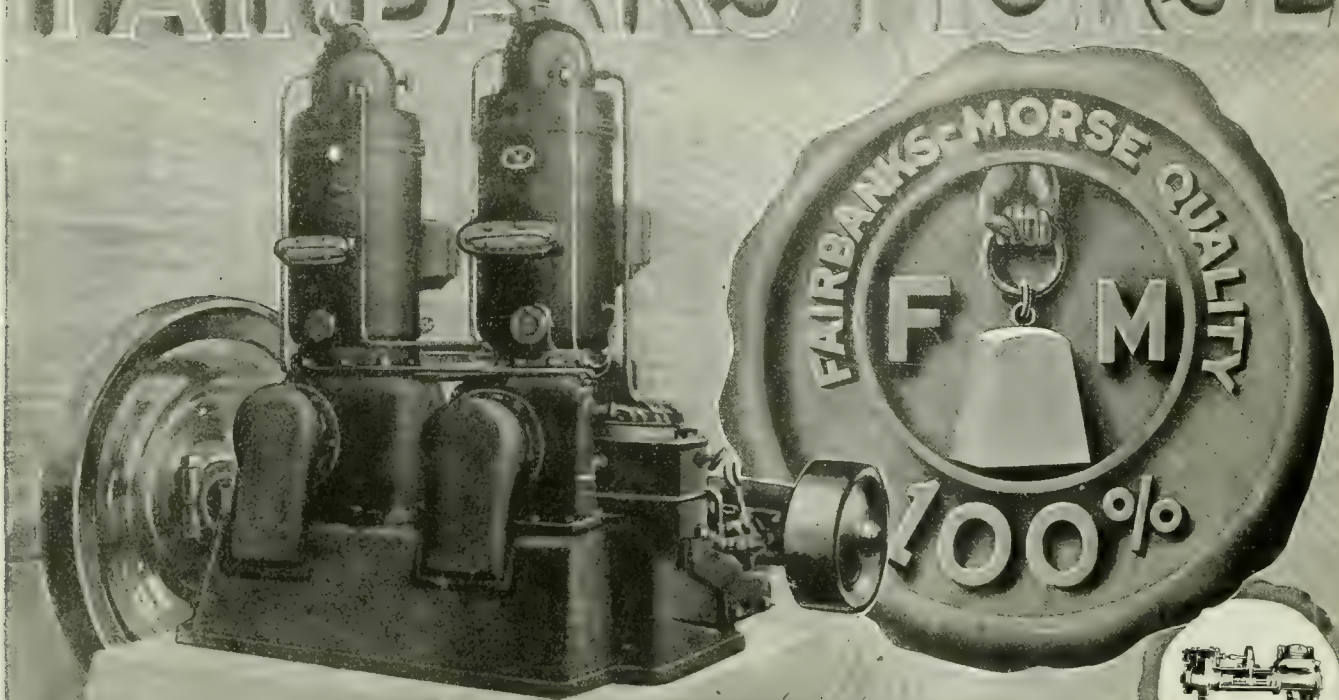

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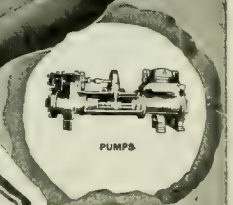

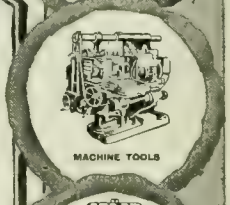

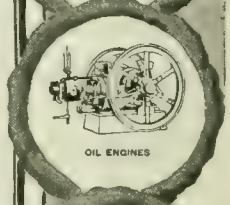

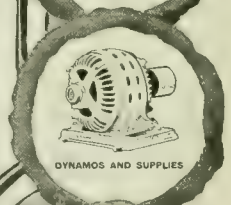

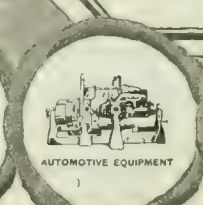

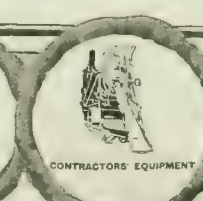

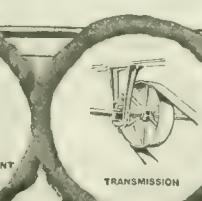

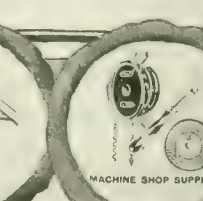

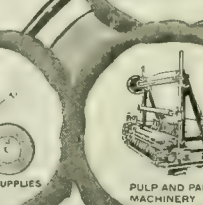

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 6 February 10, 1921

Making One Thousand Milling Machine Saddles

Equipment Necessary to Produce One Thousand Saddles Every Year. Pattern Work is Taken Up, Also Various Machining Operations, Cost of Machine Tools and Other Vital Points.

By DONALD A. HAMPSON

IN the November 11th issue of Canadian Machinery we published an article by John S. Watts, dealing with the manufacture of 1,000 milling machine saddles per year. This article created considerable interest and diversity of opinion. The present article gives another reader's views of the problem, and the information contained herein should be carefully read, then filed for future reference. Mr. Hampson, the present author, commences his article as follows:

To every production problem there are two or more answers. Given the design, the problem starts with the pattern, goes from there to the foundry, stops briefly at the tool room, then broadens out into a machine shop job of magnitude and precision.

There are three hundred working days in the year, but every production man knows that in ordinary life it is not safe to count on more than ninety per cent. of the "on paper" production per unit of time, and no executive wants to skin through on a schedule that makes no allowance for the unforeseen and the inevitable; therefore, we will map out a schedule on a basis of 250 working days per year, which calls for a production of four completed saddles a day.

Machine shop jobs may be done in several different ways. Speaking broadly, none but an egotist would say that his way was the best, for according to conditions of equipment, finance, and labor, what might be good practice in one plant would be impractical in another. But each plant, in adopting methods suited to its peculiar conditions, might turn out the same grade of accurate work at a profit to itself, and, if each obtains the same production, then each may be said to have adopted the best practice

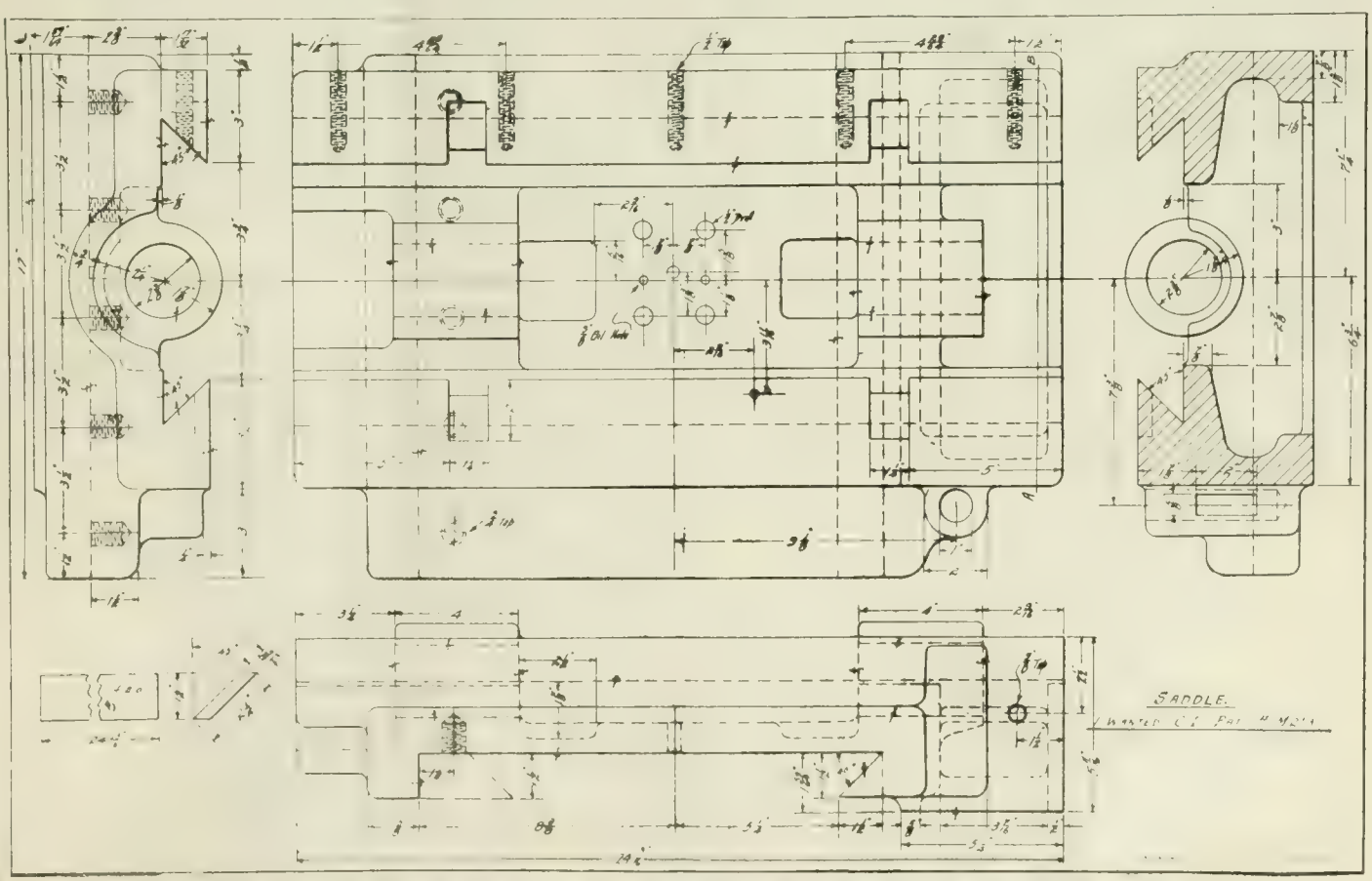


FIG. 1.—THIS SHOWS THE DRAWING OF SADDLE FROM WHICH TH E AUTHOR PREPARED HIS DATA.

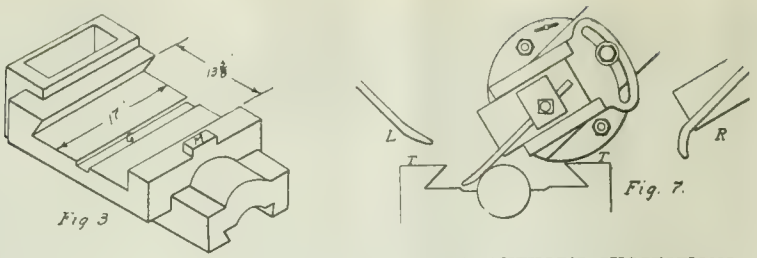
for itself. The problem varies also in whether a given part is to be made in an existing plant on tools already there, or whether the plant is newly tooled for just this piece; the former is generally the case.

Planer Work

Planer work forms the foundation upon which nearly all machinery is built, particularly is this true of machine tools. The most accurate planers and the best men are considered essential to the production of the faces, slides, and vees of all machine tools. In the face of keen milling machine competition, planer work has lost but little of its prestige—at least, for finishing cuts. The fault to be found with milling machine work comes from (1) spring of the mandrel, (2) cutter passing on and off the work surface, (3) improper grinding of cutter or inaccuracy of spindle, which makes a setting from a gage unreliable. If the miller is stopped during a cut, the first two mentioned faults may appear as a mark deeper than the rest of the machined surface, condemning it as a first class piece of work.

However, the scarcity of skilled mechanics, competition, and the lessons taught by the manufacture of automobiles, all distract the production man away from planer work. There is a "standard" method of doing high class planer work, and this will be considered first as a means of getting out the milling machine saddles. Then, a method by which unskilled men can do a goodly part of the work on simple machines will be taken up—a method in which the work is resolved into simple, single operations within the capabilities of low grade labor. The latter method will be of greater interest because of the present prices of machine tools—new planers of the sizes needed for this job costing from $4,000 to $8,000, and for a production of four saddles a day not less than three planers are required.

Figure 2 is a perspective of the miller saddle right side up. No matter how complete line drawings may be, or how well able one may be to visualize the thing they represent, a drawing in perspective or a free hand sketch will bring up points that may be wholly overlooked in long study of the original drawings. Perspectives are of invaluable assistance



FIGS 3 AND 7—ILLUSTRATING A FEW OF THE AUTHOR'S SUGGESTIONS.

to those who design tools and fixtures for manufacturing.

Returning to the first step in production—that of pattern-making. It is necessary to get out one wood pattern from which may be obtained castings in aluminum which are to be machined all over to form permanent patterns that the foundry will use for production. Even if they would stand up under long daily abuse, wood patterns would soon lose their shape so that the machine shop would be seriously retarded; good castings are hard to get under any conditions, and the best of patterns should be provided to leave no source of criticism open on that point. Rejected castings, both foundry and machine shop losses, may run from one-half to five per cent. of the total, and for these it will be necessary to make others, so that it will be required to mould four saddles every day with an additional one about once a week. If the plant's foundry uses moulding machines it will be easy to exceed this production—if all the moulding is hand work, and that is well organized, one pattern will suffice, while, if the foundry organization is more or less disrupted, two patterns will be required.

Pattern Work

Figure 4 shows how the pattern, or patterns, will look. It is cast hollow to save weight and expense and is machined all over on its exterior surfaces, with a slight draft on the vertical faces, making the side which is uppermost in Fig. 4 the smaller. This drawing shows the pattern upside down for the sake of clearness. With the exception of the guides that fit the knee of the milling machine, the entire mould is made in the drag. Four dry sand cores are used to form the undercuts and various irregular parts, and these are shown as part of the pattern: Cores 1 and 2 are made in the same box and their location is made easier by the two prints which are extensions of the cut-outs in the top of the casting. These two cores are placed first. Core 3 makes both of the feed screw holes as well as a portion of the center floor. It is made in one piece to better align the holes. Core 4 is the last one placed before the mould is closed. This core forms the space for the gear driving parts. So made, the pattern is an easy one to draw, and the cores all lie on solid sand. The preliminary wood pattern is a duplicate of the one shown, with the added allowances for finishing and contraction.

The foundry work sholud be carried on some weeks ahead of the machining, both to avoid any possible delays to the shop, and to allow the castings to season themselves a trifle. Each casting must be thoroughly cleaned and inspected before it is shipped in to the shop. If there is no sand blast available, the castings should be run for a time in a tumbling barrel. Where a foundry has a sand blast, it has compressed air, and this may be utilized for pneumatic chipping with a gratifying saving over hand work. Before getting into production, sample castings are made, to determine if everything is all right, and there is just the right allowance for finishing up. The locating points for the first operations are checked up at this time, to make finally sure that all the first workman has to do is to "clamp her down and start a cut."

The All-Planer Method

Through the use of proper fixtures, by simplifying the movements, and by curtailing some of the universal features of a planer, the saddles may be planed in half the time, and that with only an intelligent laborer properly instructed, instead of a skilled machinist. Fig. 5 illustrates the fixtures for the first operation, which is rough planing the under side. The scheduled production, being four per day, the various operations in multiple should be in units of four each.

A cast iron base plate P, about 90 in. in length, is arranged to fasten to the planer table and to take four of the saddles laid crosswise. One saddle is shown in position and near it the fixtures for another. It is far better to use a false work table, for thus the constant sliding (and peining) of rough castings is put on a more accessible part, and the slow process of sliding bolts along and cleaning long slots is avoided. And

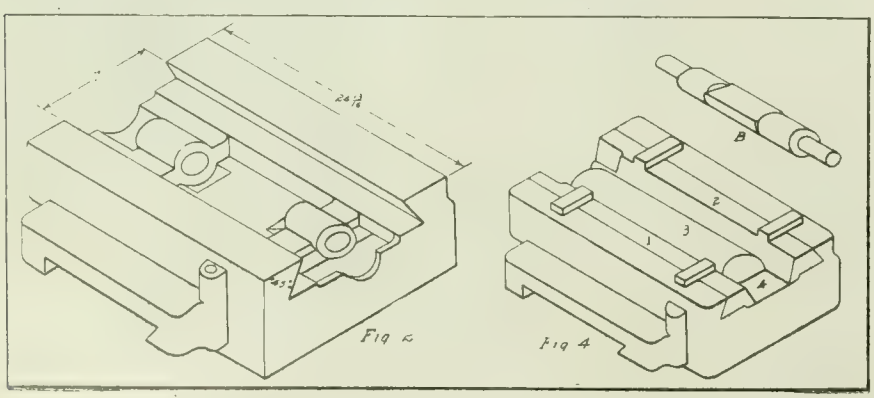


FIG. 2.—THE PATTERN, AS THE AUTHOR WOULD HAVE IT.

bolt slots rarely line up well for a string of castings.

Returning to the drawing. There are four shallow grooves cast at right angles to the direction of the cut. These not only assist in levelling up, they afford clearance for the two hubs which are higher than the straight faces of the saddle. The castings are located from the most important faces, i.e., the (miller) table vees. The locating blocks C carry steel castings with machined faces guided in short machined slots in the base P. There are two symmetrically tapered sides, and as these pieces are pushed towards each other, they accurately locate the saddle at points on its greatest length. When in position, the blocks are tightened, becoming stops for the work as well. Four clamps hold the saddles down—all but the end clamps draw on two saddles at once.

When a set of castings has been finished, the nuts are loosened and the nine bolts alongside A are slid out of their slots. A slight movement, and the castings are free of the rear clamps and may then be picked up with a hoist, or pulled further forward on shop trucks for delivery elsewhere. Cleaning the surface of the base plate P is almost nothing, for the castings are brushed off before the bolts are loosened, and there is very little dirt to fall in the short slots on the operator's side. The next set of saddles should be put on and clamped in half an hour, as an outside figure.

All the nuts on the fixture are of the same size and hardened, and the screw in the tool block should be changed to the same size. This makes one wrench the only tool the workman needs, aside from the gauge, and he should be forbidden the use of anything else. There are four plugs of hard steel—E E—set in the plate P under each saddle and these are a full thirty-second above the general surface, not enough to interfere with handling the castings, but high enough to serve as leveling spots, and it is on these spots only that any packing up is done, either with slips of paper or tin.

For this first operation a 30 x 30 x 8 ft. single head planer will be required. This will cost around $4,000. The fixtures described can be made for a minimum of $100, though work of this kind varies widely in cost under different wage scales and according to the amount, or absence of, system in the particular shop. Two sets of saddles—eight pieces—should be roughed out per day with this equipment.

The roughing operation finishes all the surfaces within one sixty-fourth of an inch. Fig 5 B shows the tool setting gauge which is clamped to the front end of the plate P. This gauge is a grey iron casting whose top face forms one of the setting surfaces and on which are screwed and dowelled the blocks for gauging the 45 deg. and the 90 deg. faces as well as the extreme height. The tools are set to the different faces of the gauge, using a paper feeler betweeen tool and gauge.

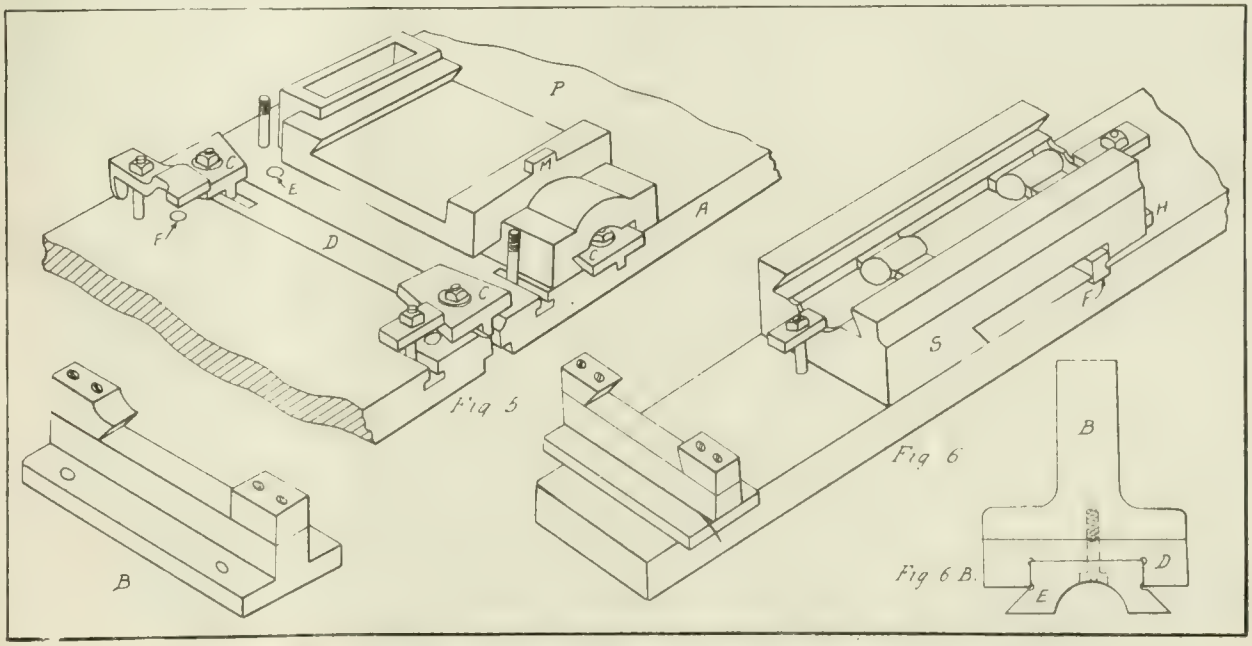
Three slight changes in the original design could be made to facilitate machining. The vertical surface of the saddle, marked S in Figs. 1 and 6, should be machined. It will aid materially in subsequent operations to do this, and it will add a degree of refinement to the assembled machine of which it becomes a part. A planer boss, M in Figs. 3 and 5, is of utmost importance in setting up the castings for several operations, and it would not detract from the finished piece to leave it after the work is done. Thirdly, a groove G in Fig. 3 will save time and tools in cutting, the broad flat under surface, if not permissible as a slight clearance on the finished piece, it will nevertheless save time if this is cast an inch wide and half or two-thirds depth.

Second Operation

Fig. 6 details the layout for the second operation, that of the surfaces on which the table itself travels. Here again a false table for the planer is used, but this one is ridiculously simple, its top surface being broken by only five studs, four right angle bars F, and eight posts H, which carry safety set screws to keep the saddles against the bars F, in addition serving as spacers betweeen castings. A tool setting gauge is provided, of similar construction to that in Fig. 5.

This operation requires a 24 x 24 x 10 planer, preferably with two heads on the cross rail. Its cost will be about the same as the other planer. A narrower planer would do this work, but most of the shops prefer to pay for a little more width between housings with so long a table. The fixtures shown will cost $70 or more. They provide for four saddles in a string, and they should turn out two full loads a day. Setting up is very simple. The under side of the casting is planed, one end a hollow square and the other the spot M offering a three-point bearing that requires a minimum of packing up under it. There is a planed edge to go next to the bar F, and two safety set screws to hold it so in line, while laterally the castings are placed so the face S is "felt" even with the edge of the false table. Five clamps hold down the pieces. In case the suggestion to plane S is adopted, the castings have to be set overhanging the edge.

Workmen's gauges for the job are made up as shown at Fig. 6-B, consisting of a cast iron handle B and two hardened steel pieces, D and E, of such a shape that they may be readily ground on all important faces. A similar gauge



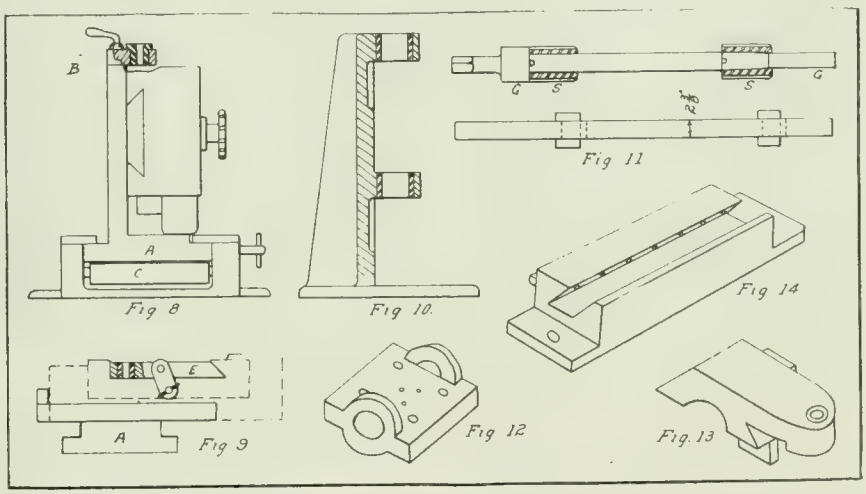
FIGS. 5 TO 6B THE TEXT MATTER EXPLAINS THESE VIEWS THOROUGHLY.

is made for checking the planing of the bottom surfaces of the saddle. The estimated cost of the two vee gauges and those of the tool setting is placed at $60.

Taking up the actual cutting of the top of the saddle, it is found that the screw bosses are rather in the way. However, this is not as bad as it seems, for there is width of clearance next them. Referring to Fig. 7, the planer head is set at 45 deg., and a taper dowel put in, so that the exact location is quickly found without depending on graduations. The clapper block is stripped of the usual tool fixtures and is provided with an extension for tool support which is slotted for the tool, and fitted with a single clamping screw. Tools, tipped with high speed steel and ground to gauge, are provided in duplicate, and these are ground on the top only, always maintaining the same shape. With this equipment, tool setting is not a matter of guess work, nor subject to the whims of the operator, hence the time has to use or loose pieces or unnecessary nuts to tighten, the greater is the production.

The saddles are now roughed out all over, if possible. This part of the work should be kept a month in advance of the rest, so that the castings may be given a chance to season. The best time for this is after the outer skin has been removed. A piece of this shape and weighing nearly 300 lbs. will not warp much, but even if it changes as much as a piece of paper, that little must be taken into account and the planer hand, in setting up for the finish cuts, must pack up closer than this.

Our two roughing planers are placed side by side, but facing in opposite direction with the operator's sides together. One man can then attend to both machines very nicely, though there will be times when a helper can be used to advantage in loading and unloading. This way it is possible to get eight complete saddles a day from two machines, one planer hand and a helper. There is a greater



FIGS. 8 TO 14 (INCLUSIVE)—SHOWING VARIOUS MINOR OPERATIONS.

is cut to a minimum and uniform results are secured.

Another point: With two heads on the rail, each may be left permanently set at its own 45 deg. angle, with the left head presenting its tool as seen at L, Fig. 7. It is unnecessary to swing the right hand head back to zero to plane the top faces T, for by having a tool as shown at R, the work may be done equally as well. In case no two head planer was available, much the same system would be followed. The slot in the clapper block would have to be in the middle, two holes for the 45 deg. locating pin would be provided, and the planer head stripped of the unnecessary bolts and nuts that have to do with the angular adjustments and the clearance swivel, leaving just the three shown. These three left, the tool post screw, the table shifting dogs, and the nuts on the table fixture, all use the one wrench. This latter principle should be followed throughout, for a careful study of workmen will prove that the fewer tools he area to cut on the under side, but there is so much better chance to get at it, so it can be done as quickly as the top.

Finish

Coming to the finishing cuts. Two more planers are required. If the shop were doing nothing but making one size of saddle, it might be possible to get along with just the two planers, though it is doubtful if the yearly production could be obtained by any method without a third planer part time. The chances are that more than one size of machine is being built, in which case it is better to keep planers for finishing alone. For finishing, it will pay to have two false tables or plates similar to those of Figs. 5 and 6. One will be identical with that of Fig. 6, the other will be like Fig. 5, but with a single cross piece taking the place of the two tapered blocks, the cross piece aligning the work and taking the thrust of the cut.

The tool setting gauges will be like those used for roughing out, and there will have to be another set of gauges for the vees. Finishing tools will be similar to the roughers but keener, and those for the V sides must have sharper points. Feeds will also be less. The drawing shows sharp corners, but it is safe to assume that the sharp male edges on both the table and the saddle can be taken off to a ⅛ inch flat. It it better so from every standpoint, and then the corners at the bottom of the V may show a slight fillet. Finish planing will take about a third longer than roughing, and it is safer to put one man on each planer, holding him strictly accountable for results.

Minor Operations

A number of miscellaneous operations follow the planer work. There is probably more chance for ingenuity here than on the planer work. The work is mostly drilling and tapping. Except for the larger drill screw holes, it would be possible to do all of this drilling with an electric drill, and to tap by hand. This would avoid considerable jig expense and some handling of saddles on and off the drill press, but it would take longer to do the work. A radial drill or an upright drill of around 30-inch size will do the work. The writer prefers the upright drill because of its fixed center, and ease of operation.

Fig. 8 shows the jig for drilling and tapping the set screw holes. There is a base that bolts to the drill press table. It carries six rollers C, on which travels the right angle piece A, which is located by the pin at the right points according to the set screw spacing. The saddles are held upright by two hand clamps, and the drill guided by bushings in the removable piece B. After the holes are drilled, the drill is removed, a tap inserted, and the holes threaded as A is run back to the loading station. The drill press, of course, must have a tapping attachment. A quick change chuck should also be added.

Fig. 9 shows a similar operation for the bottom gib holes. Another casting A is made for the same base, runs on rollers, and is indexed the same way. Its upper portion is a short section of a V slide. The saddle is placed on this and needs no other fastening. A jig piece E carries drill bushings and is held in place by its fit and end stops, one of the latter swinging.

To bore the screw holes, the fixture in Fig. 10 is clamped to the table. A three or four lip twist drill is the simplest tool to clean out the hole ready for reaming (on cheap work, this would make a very fair hole in one operation). The saddle is located and fastened by simple parts, omitted for the sake of clearness on the drawing. The two tools shown in Fig. 11 finish the holes and ends. The upper one is the reamer built up of two shell reamers and a ground shaft. This could be used in the machine by changing bushings, but the

writer prefers this to be a line reamer, used by hand, cutting at S and S, and guided by the parts G and G running in blocks which fit the saddle vee. The other tool is a facing bar that is guided by the finished holes, and uses standard cutters that are changed for the reverse facing. A gauge for this must be made. It may be of heavy sheet metal, hardened and ground.

In the center of the saddle is a group of small holes that are best included in one jig as shown by Fig. 12. This is a cast iron block containing the seven bushings—it drops into the depression in that part of the saddle and is located by passing short pieces of shaft through the large holes into the counterbores shown.

A one inch pin is employed for the feed throw-off and the hole for this is made by the jig in Fig. 13. This slides in the table vee and is located for distance by the strap butting against one finished end of a screw boss, and it is secured by a temporary set screw in the end hole. A somewhat similar jig serves for the ⅝ inch tapped hole on the side.

The above enumerated tools will cost between $500 and $600 with high speed cutters. The drill press will cost about $700 and it should be able to take care of all this work with a good operator. The large holes for the screw could be done more conveniently on a horizontal boring machine, but this job alone would occupy it but a fraction of the time.

The table gib is planed on the edges in the fixture of Fig. 14. Several are placed in at once, and a planer cut run over them. If this part is cast iron, it will require facing on the flat sides first by customary methods.

The Drilling Method

The group of drawings included by Fig. 15 illustrate the milling machine method of roughing out saddles. With the exception of the cutter in No. 6, the fixtures and cutters would answer for a full line of sizes in case the manufacturer was making them, and the equipment is capable of producing the same if required. Some manufacturers might use the miller method entirely, and make but the one cut across each face, this serving as both roughing and finishing. The results would be very close, but there is no disputing the fact that the job would not have the accuracy of the second operation method as done on a planer. The comparison would be like that of war tools and pre-war tools.

Lincoln millers of the planer type will do this work as well as plain millers and they cost a great deal less. The five millers required can be bought new and leave half of the price of the vertical miller, for operation 6, for what one 30 x 30 x 8 planer would cost. Fixtures, arbors, and high speed cutters will cost approximately $650. In the drawings T is the miller table. The

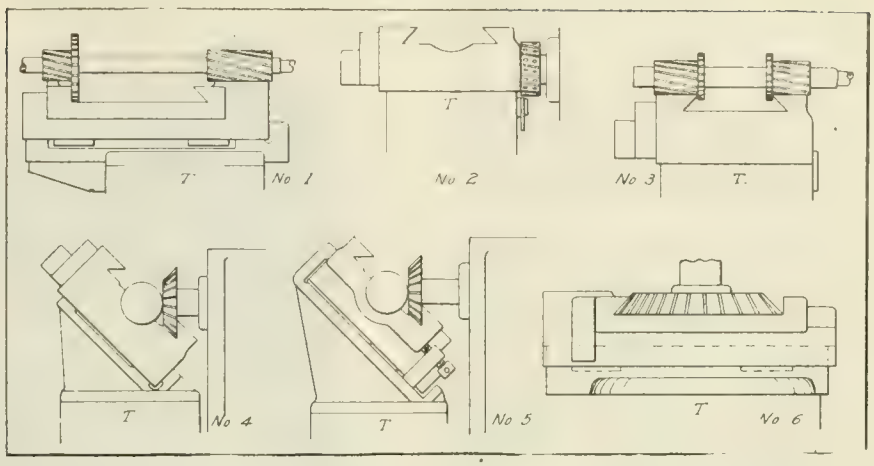


FIG. 15.—THE MILLING MACHINE METHOD OF ROUGHING OUT SADDLES.

clamping bolts and straps are omitted. These are arranged for either one wrench, or hand operation, and to swing or lift out of the way, so there is a clean straightaway for moving the casting on and off.

The drawings explain themselves. Each face as it is cut becomes the bearing surface for the next operation. Nos. 4 and 5 show how the upper vees are machined—the work is held in both cases from the same locating surfaces, and the writer speaks from experience that this is the method that will take all the curse out of a 45 deg. bevel. No. 6 is the method of doing the under vee. This is on a vertical miller, using a cutter with inserted blades (which may be home made), and holding the work by a fixture whose upper part is like the vees of the table. A straddle mill in the gang of No. 1 squares the corner and vertical side so the angular end mill merely scrapes off a finish at this point.

These planer millers should be arranged in a row and timed so that each will finish a piece ready for the next machine. In this way there will be no floor to floor handling, for there should be either a conveyor system or a metal topped table between machines so that the operator can slide the parts along without assistance. At two places along this "railroad," the casting has to be turned over, which may be accomplished by a simple rig. To get the castings up in the 45 deg. position, the conveyor rolls are stepped from horizontal to 45 degrees and the twist is made in a short distance. This railroad is arranged so that the castings cannot fall off. The castings are delivered on the starting end of the line, and the table of the first machine runs right up to this point, then the track begins again where the table travel ends. The casting is removed, and the table run back by hand. One operator can easily attend to three machines, and at a feed of half an inch per minute two castings per hour can be produced on each machine.

BENDING PIPE

Bending pipe is by no means a simple task. There is always a right and a wrong method. In bending large pipe you should fill the pipe with dry sand and plug the ends. Heat to a red heat in localities to be bent, then bend. Be sure that the sand is dry. Where bends are slight it is often unnecessary to use sand or rosin. The object of sand or rosin is simply to keep the sides of the pipe from collapsing, or, to prevent reduction of flow area. If wet sand is used, and if the ends are plugged, the pipe may burst when heated, due to the steam pressure generated.

Rosin is also good. But there is a "right way" and possibly several wrong ways to use it. For example: A mechanic was recently bending a pipe, and he first of all filled the pipe with rosin, plugged the ends, and heated the pipe at the place where he wanted to bend it. He watched for a "red heat" just as he would had he filled the pipe with sand. The result was of course a violent explosion.

The correct way to use rosin is to pour it into the pipe and allow it to cool and harden. As soon as the rosin is hard, bend the pipe cold. Don't heat it. Then after the pipe is bent, heat the pipe all over sufficiently to melt and remove the rosin.

Production Foundry Ready. — Dominion Motor Castings, Limited, of Windsor, have about completed the equipment of their new foundry and expect to be in operation within a fortnight. The foundry has a molding floor of about twenty thousand square feet, and a production capacity of 35 tons of gray iron castings. The equipment is of the latest type and includes at present Osborn machines on the molding floor, McDougall rumblers, Sterling grinders, Preston sand riddles, with much more to be added. The whole plant is designed primarily for high production rather than jobbing purposes. The officials are: President, A. Morrell, formerly of Windsor Machine Company; vice-president, R. P. Marintette; secretary-treasurer, C. A. Ripley.

Turret Lathe Applications

The tooling necessary for machining an engine cylinder, a clutch cone, a clutch cone gear, and a peculiar shaped tractor driving axle arm.

By J. H. Moore

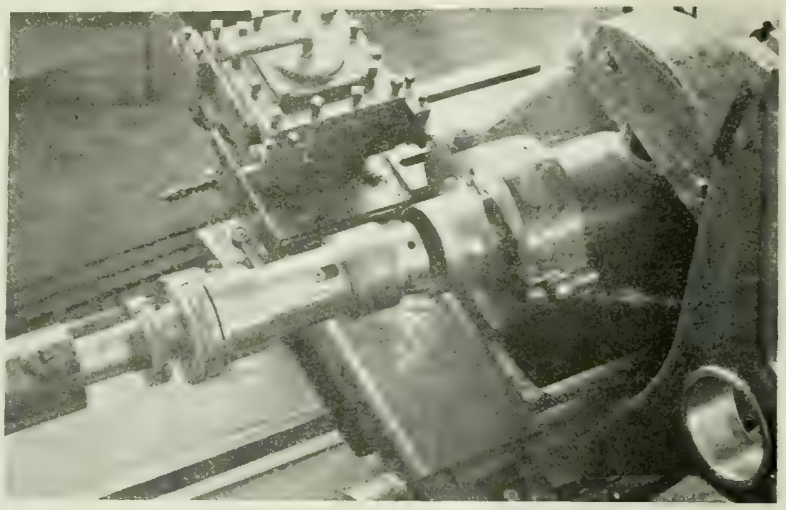


FIG. 3.—A CLOSE UP OF THE CYLINDER IN THE LATHE

IN the present article we will take up a few more examples of work performed on Gisholt turret lathes. The first of these examples is shown at Fig. 1. The piece illustrated is a cylinder used on the Liberty truck engine, and the machining of the same demands some clever tooling. At Fig. 2 we see a complete view of the equipment, while at Fig. 3 is shown a closer view of the expanding boring bar used in finishing the enlarged chamber at the bottom of the cylinder. This bar is depicted at the point of entering the cylinder. Fig. 4 illustrates the tool layout adopted in finishing this cylinder, which is made from semi-steel.

Having explained these essential points let us follow, step by step, the method used in completing this piece. The work is held securely in a special fixture made to suit the shape of the casting. The general design of this chuck can be noted at Fig. 3. This fixture is bolted to the regular chuck of the machine. At the front portion of this fixture there is a hinged arm that encloses the cylinder, after it is mounted in position. A pin is inserted at the chuck end of the fixture, this pin centering and locating the cylinder. Fig. 4 illustrates this clearly. The segment of cast iron, shown at the top of fixture, is simply placed there to counterbalance the weight of the lower part of the fixture.

The surfaces A, B, C, D and E are now rough machined with the tools F and G in the toolpost. Simultaneously the bore H of the cylinder is rough bored with the cutters shown in the head of the boring bar at position 1 of the turret. This bar is supported by means of a steady rest, this rest being shown in diagram form at Fig. 4. It has a bushing in it that fits the outside of the bushing J shown mounted on the bar.

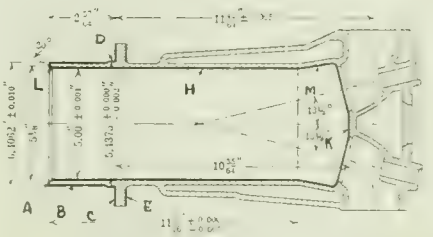


FIG. 1.—SECTIONAL VIEW OF THE ENGINE CYLINDER TO BE MACHINED.

Reference to Fig. 4 should make all these points clear.

The bore H is next finished with a cutter held at position 2 of the turret. The bar which contains this cutter is supported in similar manner to the one already described. The bore H is now reamed by means of the reamer shown at position 3 of the turret.

The next step consists of rough facing the bottom K of the cylinder. This is really called the combustion chamber and the operation is performed by means of the cutter held in the bar held in position 4 of the turret. This bar is provided with a bushing that is steadied by the bore of the cylinder itself.

The surfaces K, L, A, B, C and D are next finished with cutters held in the facing head and bar mounted at position 5 of the turret. The bore of the cylinder at M is now bored with cutters held in the bar shown at position 6 of the turret. These cutters enlarge the bottom, or dome of the cylinder as it is often termed. The cutters are of the expanding type, so that having entered the cylinder, and reached the bottom, they are spread, in this way machining the enlargement. The bar used for this operation is provided with a ball thrust collar which is connected with the cutters in such a manner that when the collar strikes the end A, and the bar still continues to feed in, the cutters are expanded. The collar we speak of is clearly shown at Fig. 3.

The under side of the flange E is next

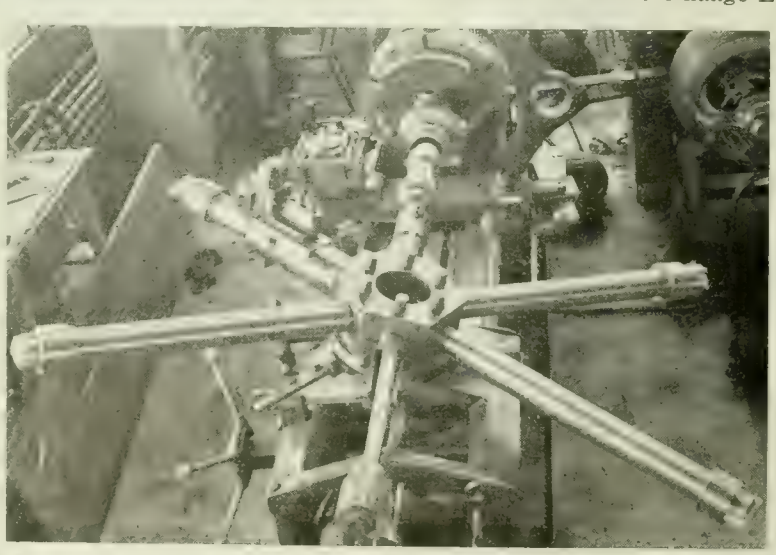


FIG. 2. A TOP VIEW OF THE TOOLING EQUIPMENT USED ON PIECE AT FIG. 1.

finished with the tools held in the holder O in the toolpost. This completes the cylinder, and the total time of all operations is 25 minutes floor to floor time.

Clutch Cone Gear

The next example is that of a clutch cone gear, shown at Fig. 5. The surfaces to be machined are depicted by means of heavy lines, and the work is completed in two operations. Figs. 6 and 7 show the first and second operations respectively, while Fig. 8 illustrates the style of taper boring head used for boring this gear. Referring to Fig. 6, it will be noted that in the first operation the cone is held by its large conical end next to the chuck. Special chuck jaws are bored to fit the outside tapered surface, and in this operation the hub is

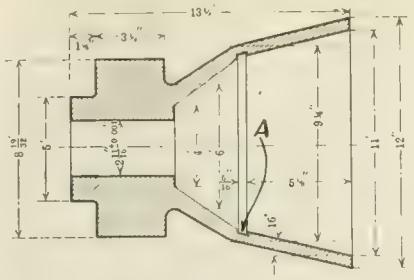


FIG. 5.—SECTIONAL VIEW OF CLUTCH CONE GEAR.

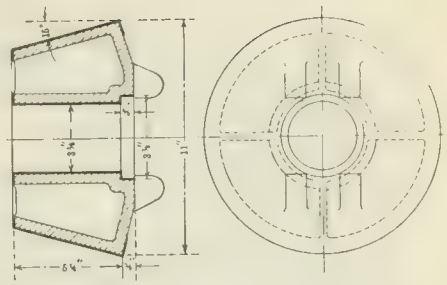


FIG. 9—SECTIONAL VIEW OF THE CLUTCH CONE.

turned by tools in the toolpost. On this being completed, the inside tapered surface is bored with the tool depicted at Fig. 8. The inside and outside are bored and turned simultaneously as can be noted at Fig. 7. In this photograph both

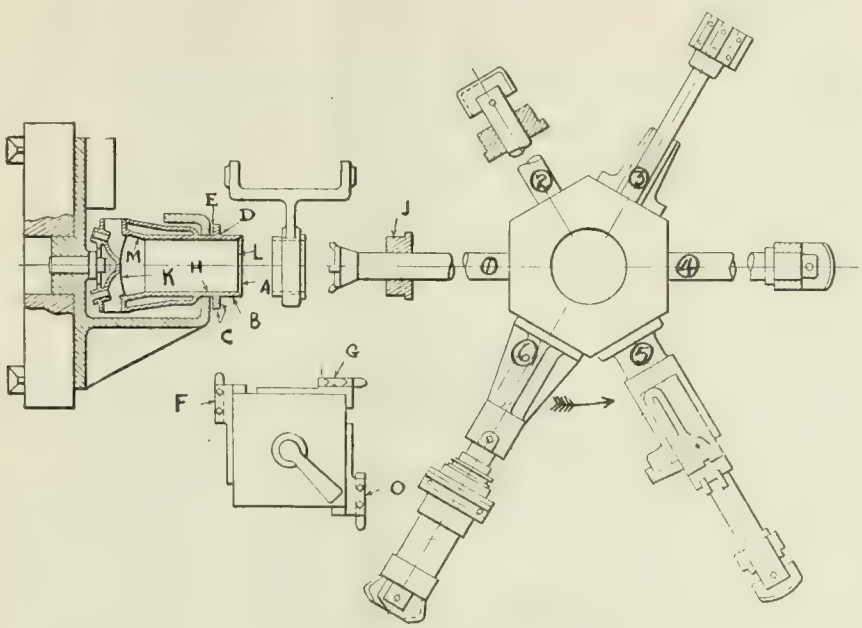


FIG. 6.—LAYOUT OF TOOLS FOR FINISHING THE CYLINDER SHOWN AT FIG. 1.

faced, the hole bored and the front end and outside of the gear are machined.

The work is now turned around and held as shown at Fig. 7. In this case the machined outside surface of the gear is gripped, and the work held in position with soft jaws. The outside tapered surface of the cone is rough and finish

the turret tools and the toolpost are shown in action.

It will be noted that a clutch cone part is shown in section at Fig. 8. This is done in order to make clear the action of the special taper boring head. The cone shown in the illustration is of slightly different design, but in the main the principle is the same. The taper for the friction is bored with a single point tool which is properly guided to produce the correct angle. In action here is what occurs: A pilot enters the bushing on which the clutch cone is centered. This guarantees that the friction cone will be concentric with the hub. A ball thrust bearing is provided at B, and this bearing bears against the end of the bushing in the chuck, in this way preventing the pilot from entering further into the hole.

In this way the tool is properly located with relation to the tapered surface. As the head is fed forward over the pilot, a pin resting against the angular surface C guides the tool in at the proper taper, the slide holding the tool being forced down by a spring as the head feeds inward.

The recess shown at A, see Fig. 5, is cut with the tool held in the long tool holder shown in the toolpost at the front in Fig. 7. This recess must be made in the way to provide clearance for the tool in the taper boring head mounted in the turret. The complete time on both these operations is 60 minutes.

The Cone

Let us next consider the cone used on the gear just described. The piece is shown at Fig. 9. This piece is finished on all surfaces shown in heavy lines and the material is cast iron. Two operations are necessary to complete the part, and Figs. 10 and 11 illustrate both operations on this piece. In the first operation, see Fig. 10, the cone is held in the chuck by means of special chuck jaws which grip it on the inside at the small

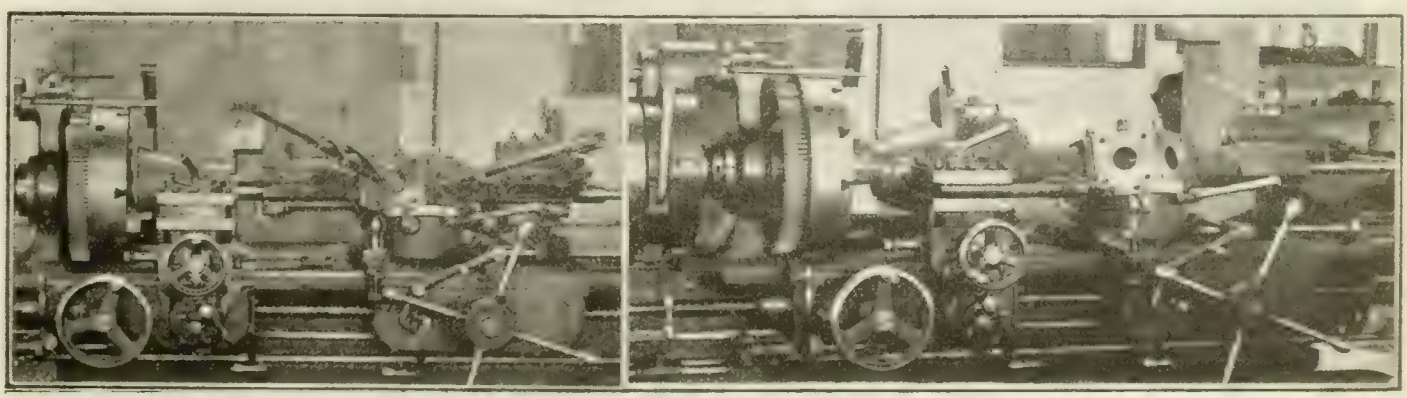


FIG. 6.—TOOLING USED ON FIRST OPERATION OF CLUTCH CONE GEAR.

FIG. 7—THE SECOND OPERATION ON THE SAME PIECE.

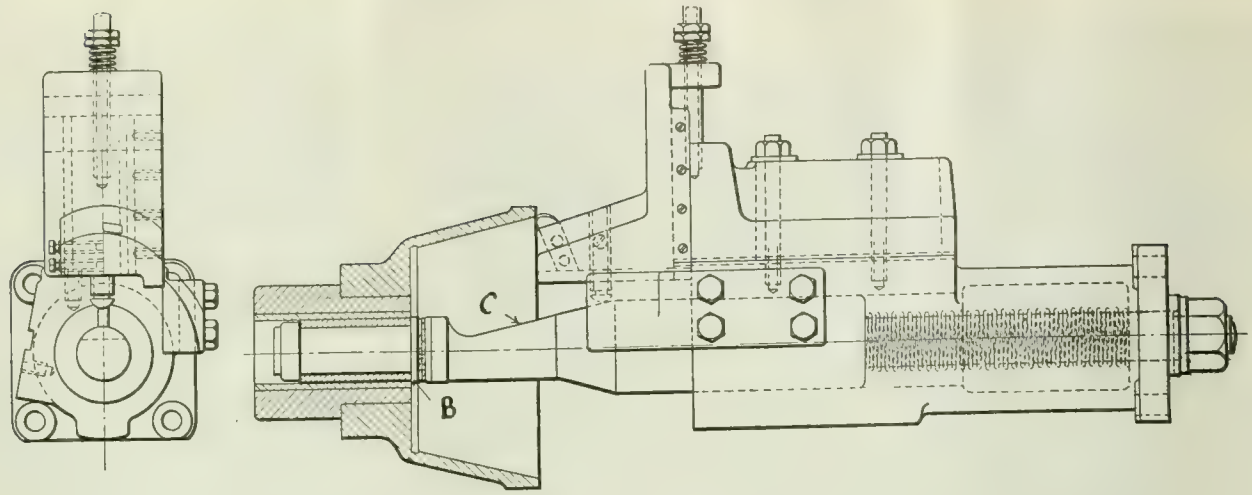


FIG. 8.—DETAILS OF TAPER BORING HEAD USED IN BORING THE CLUTCH CONE GEAR.

end of the taper. The outside of the cone is then rough and finish turned with tools held in the toolpost. At the same time the inside is rough and finish bored, also reamed by the various tools in the turret.

The work is held by soft chuck jaws in the second operation, and is gripped on the outside of the large end of the tapered surface. This is clearly shown at Fig. 11. The small end of the cone is then faced by a tool held in the toolpost, this completing the operation. The total time required for both these operations is 25 minutes.

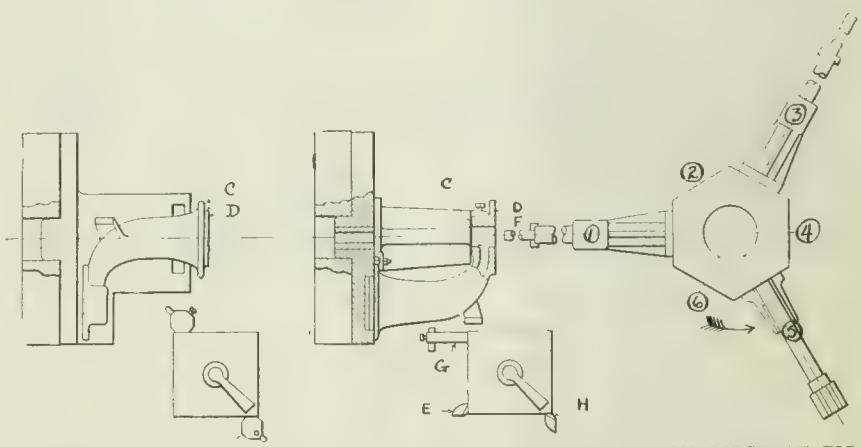
Tractor Driving Axle Arm

The remaining example in the present article is shown at Fig. 12. This piece is what is known as a tractor driving axle arm, and is machined on a 24-inch lathe. It can be readily understood that the chief difficulty in handling a piece of this nature is the deciding on the best method of holding. The arm is made from cast iron and is machined on the surfaces indicated by the heavy lines.

In the first operation the work is held on a special angle plate as shown at Fig. 13. It will be noted from this view that the work is held in vee blocks. The piece is now rough and finish machined on the surfaces C and D. This is accomplished with tools held in the toolpost, the time required for this work being nine minutes.

The tool layout for the second operation is shown at Fig. 14. This work consists of boring the hole in the outward end of the arm and facing the flange. The rear side of hub at C is also faced. The work is first placed in a special fixture, which is clearly shown at Fig. 15. The piece is held by clamps that force the finished bottom flange against the chuck plate. In addition to this, an auxiliary supporting clamp is used, this steadying the arm near the end where it is machined. The flange shown at D in Fig. 14 is next rough faced by means of the tool E in the toolpost.

The hole F is now rough bored with the cutters held in the bar at position 1



LEFT HAND VIEW FIG. 13, SHOWING THE FIRST OPERATION ON PIECE AT FIG. 12. THE OTHER VIEW, FIG. 14, SHOWS THE SECOND OPERATION.

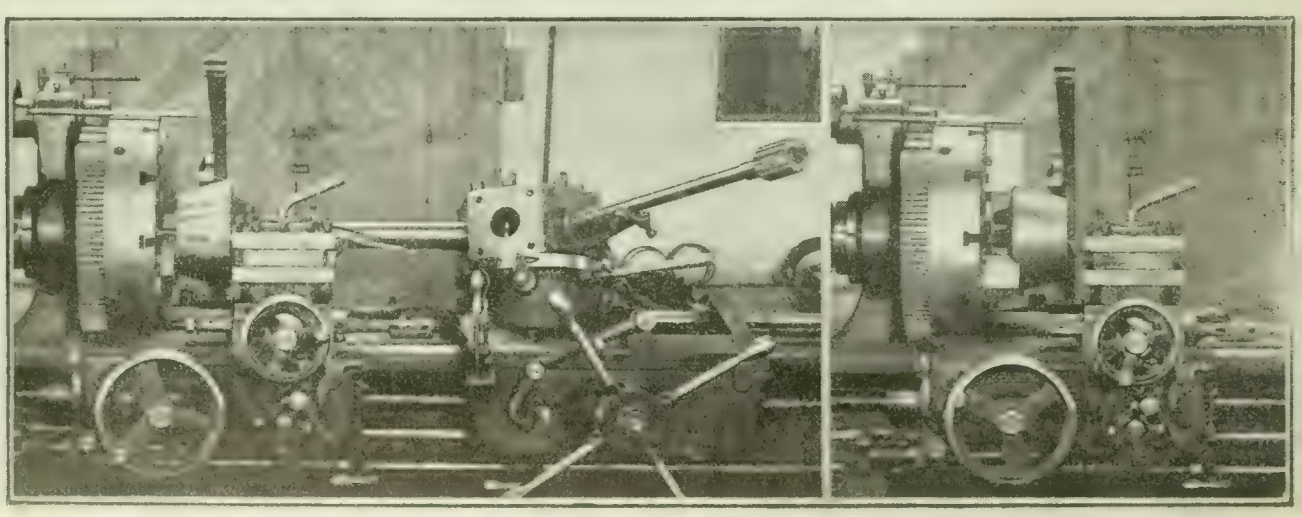


FIG. 10 THE FIRST OPERATION ON THE CLUTCH CONE.

FIG. 11.—THE SECOND OPERATION ON THE SAME PIECE.

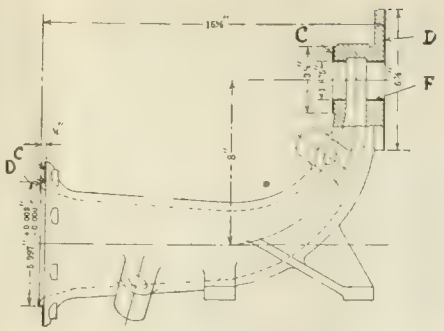


FIG. 12 HERE IS A PECULIARLY SHAPED PIECE TO MACHINE ON A TURRET LATHE.

of the turret. The same hole is finish bored by the bar at position 3 of the turret. After the finish boring it is reamed with the reamer at position 5 of the turret. After this, the face D is finished with the tool H in the toolpost, the rear face C of the hub is next faced with a tool held in the bar G mounted in the toolpost. This bar can be clearly seen at Fig. 15. The total time for this second operation is 9 minutes.

In a later issue we will show still further examples of work performed on these lathes.

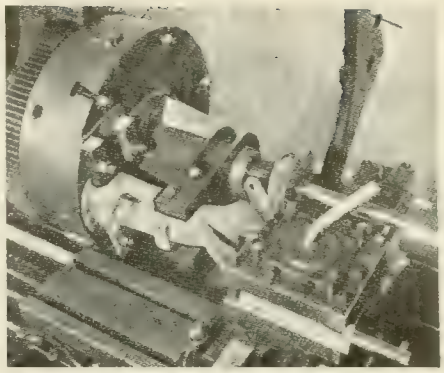


FIG. 15.—A DETAIL VIEW SHOWING THE WORK HOLDING FIXTURE.

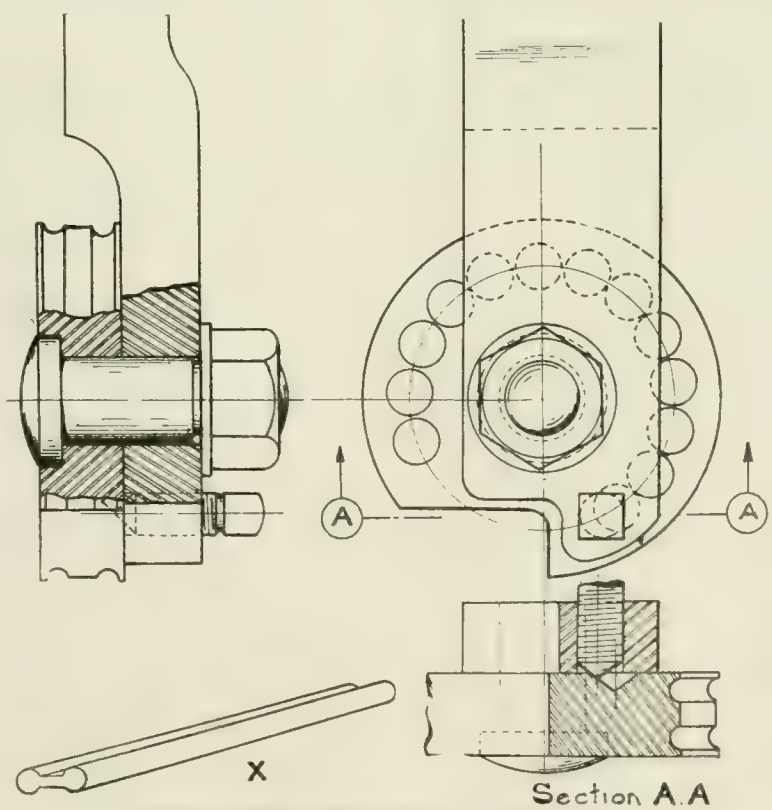
A Shaper Form Tool of Interesting Design

By TYKE

FORM tools can be successfully and economically used in the producing of duplicate pieces even though only a few parts are required. By few, of course, we mean at least a hundred, as less than that quantity makes the initial cost of the tool almost prohibitive.

Some time ago we had a few hundred strips to make of the form shown at "X." Several methods were tried with varied success, until the writer hit upon the idea of using a form tool in the shaper. Previous to this a single concave radius tool had been used in the shaper but this tool has received a lot of abuse by the different ideas of grinding the same; then again, the centre of the circular portion of the strips had to be reasonably accurate, and it was found that this dimension varied considerably according to who had the work in hand. As these strips were wanted from time to time, and any lapse of time between one lot being made up and another resulted in an alarming amount of variation in the form of same, it was decided to make up a form tool as shown in the accompanying sketch. One feature of this particular tool that is of interest, and saved considerable time and trouble, is the method of backing up the tool proper against the shock it receives upon coming in contact with the work, and of the almost hair-like adjustment of the cutting edge. This was accomplished by having a circular series of countersinks on one side of the tool, and having a hardened set-screw pass through an extended portion of the holder at the proper radius from the centre. It will readily be seen that by screwing this set-screw in until its point just enters the countersink the circular tool is backed up against the impact which takes place when in action.

Again, after grinding face of tool, it was found that the cutting edge could be brought to its proper position by merely giving the set-screw a half turn or so and thereby bringing the cutting edge a little more forward, after which the centre stud nut was tightened up. This special adjustment was found particularly useful when setting the tool in the first instance, as the proper angle of clearance could be easily and quickly arrived at without taking the tool out of the clapper box. Granted, any radial movement of the form tool made a slight variation of the form produced, but this was not of any great importance as the job in question did not call for any microscopical accuracy. After the strips were shaped on both sides, having a pin just strong enough to support it, the strap portion was broken off and the strip placed edgewise in the vise and any fin remaining on the strip was merely shaved off, using one radius of the form tool only. When the tool had been in use some considerable time and frequent grindings resulted in the set-screw registering in the countersink to its full depth, a little more was ground off and the screw point when passed into the next countersink. No doubt the same idea can be utilized in some other form and it is with this in mind that the idea has been passed along.



VIEW SHOWING THE DETAILS OF THE TOOL.

The Use of Chains and Other Lifting Gears

THE department of internal affairs in London, England, have issued a pamphlet dealing with the use of chains and other lifting gears. This subject is dealt with in considerable detail, but the data to follow form the portion that we believe will be of especial interest to our readers.

The safe working load for chains is given, in tons, as six times the square of its diameter. This differs from the American rule, which is $2.8d^2$—this giving a factor of safety of 4.5. Descriptions of the various types of chain and attachments are given, and the table, as shown in this article, is used to illustrate the safe loads that can be put upon two-legged slings, with the legs at various angles.

The pamphlet also includes some remarks on the testing, inspection and annealing of chains, and concludes with the following summary of precautions:—

(1) Chains and other appliances used for lifting purposes should be obtained from reliable manufacturers. The maximum working load and the purpose for which the chain or appliance is to be used should be clearly stated when ordering.

(2) No chain or other appliance should be used for lifting or similar purposes unless—(a) A test certificate has been obtained from the manufacturers showing the proof load to which it has been subjected and the name of the person responsible for the test; (b) a guarantee has been obtained from the manufacturer as to the quality of the material used, and that the chain or appliance has been thoroughly examined by a competent person after testing and found free from flaws, defects or deformation.

(3) The necessary information should always be available for any person using a chain or other appliance, to enable him to ascertain the safe working load for such chain or appliance.

(4) The maximum working load for any short or close-link chain should not exceed $6d^2$ tons, when used under normal conditions without shock; $5d^2$ tons, where there is any special danger to life or limb, or $3.5d^2$ tons where the chain is subjected to shock or heavy wear, or is used for lifts of molten metal or heated liquid; d being the diameter in inches of the iron of the chain. The maximum working load for a long-link chain should not exceed two-thirds of that for a short-link chain of the same diameter.

(5) When chain slings with two or more legs are used with the legs inclined, care should be taken to ensure that the maximum load in each leg does not exceed that given in recommendation 4 of the table shown.

(6) When the actual weight of an article to be lifted is not known, an approximate computation should be made, and lifting appliances should be used which allow an ample margin of safety.

(7) Load indicators and overload detectors should be used in connection with lifting appliances, especially jib or derrick cranes, whenever reasonably practicable.

(8) Slings or other chains should never be shortened by tying knots in them, and wood or other suitable packing should be provided to prevent the links coming in contact with corners of loads of hard material.

Safe Working Loads for Two-legged Slings.

Chain diameter inches	Safe working loads in tons and cwt. for given angles between legs. 0 deg.	30 deg.	60 deg.	90 deg.	120 deg.	150 deg.
3/16 ...	0-8	0-8	0-7	0-5	0-4	0-2
1/4	0-15	0-14	0-13	0-10	0-7	0-3
5/16 ...	1-3	1-2	1-0	0-16	0-11	0-5
3/8	1-13	1-12	1-9	1-3	0-16	0-8
1/2	3-0	2-17	2-12	2-2	1-10	0-15
5/8	4-13	4-10	4-0	3-6	2-6	1-4
3/4	6-15	6-10	5-17	4-15	3-7	1-14
7/8	9-3	8-17	7-18	6-9	4-11	2-7
1	12-0	11-11	10-7	8-9	6-0	3-1
1 1/8	15-3	14-12	13-2	10-14	7-11	3-18
1 1/4	18-15	18-2	16-5	13-5	9-7	4-16
1 3/8	22-13	21-17	19-12	16-0	11-7	5-17
1 1/2	27-0	26-1	23-8	19-1	13-0	6-19
1 5/8	31-12	30-1	27-8	22-8	15-16	8-3
1 3/4	36-15	35-9	31-16	25-19	18-7	9-9
1 7/8	42-3	40-14	36-10	29-16	21-1	10-17
2	48-0	46-8	41-11	33-18	24-0	12-7
2 1/8	54-2	52-6	46-18	38-5	27-1	13-19
2 1/4	60-15	58-12	52-12	42-19	30-7	15-13
2 3/8	67-12	65-6	58-12	47-16	33-16	17-8
2 1/2	75-0	72-9	65-0	53-0	37-10	19-7

(9) Sling chains and other lifting appliances, when not in use, should be stored under cover and kept on suitable racks or pegs.

(10) Every chain or appliance used for lifting purposes should be marked with an identifying letter or number, either on the chain or appliance or on a tablet attached thereto.

(11) All chains and other lifting appliances should—(a) If used for lifting in connection with molten metal or molten slag, be examined at least once in every month and be annealed at least once in every six months; or (b) if used in connection with lifting machinery or plant operated mechanically or electrically, or used for lifting in metal foundries other than that mentioned in paragraph (a) above, be examined at least once in every three months and be annealed at least once in every twelve months; or (c) if used for classes of lifts other than those mentioned in (a) and (b) above, e.g., in connection with hand cranes, be examined at least once in every six months and be annealed at least once in every two years; or (d) if used for holding down any crane or other lifting machinery upon a stage or platform should be examined as far as reasonably practicable, in situ, at least once in every three months, and be fully examined and annealed at least once in every twelve months, unless the nature of the operations preclude such examinations and annealing.

(12) A chain or other appliance should not be used for lifting its maximum working load if the wear at any part exceeds 10 per cent. of the nominal dimension of that part, or for lifting any load if it has been subjected to a severe shock or is deformed or otherwise injured.

(13) A chain or other appliance which has been altered or repaired should be re-tested before use.

(14) A record with full particulars should be kept of every chain or other lifting appliance.

OVERHEATING ALUMINIUM

While it is important to maintain a low-pouring temperature for casting aluminium alloys, it is equally important to avoid overheating the metal in the furnace charges. Doubtless some advantage is gained when overheated melts are allowed to cool to the correct pouring temperature, and part of the danger of overheating is minimized by so doing. Nevertheless, continues the Engineer, for aluminium, overheating is very objectionable because of the rate of dissolution of iron from cast iron melting pots and of the reduction of silica from clay crucibles, as well as absorption of gases from the local atmosphere. For molten metals, the absorption of gases increases with rising temperature, this being possibly due to the fact that metals form loose compounds with hydrogen and nitrogen. The absorbed gases are often held by the metal until solidification starts. when they are liberated and cause unsoundness. Hence an overheated melt would contain more absorbed gases than one not overheated, and it would be expected that castings poured from the former would be more unsound than those poured from the latter.

Switzerland is one of the principal producers of aluminium. In 1918 this country exported 10,500 tons of raw aluminum, to a value of 51,000,000f. To the figures stated must be added 2,000,000f. of bar and sheet aluminium, 6,500,000f. of technical appliances, and 3,200,000f. of other articles in aluminium. With the end of the war in 1919 the export of aluminium technical articles fell off, while that of household items was doubled. The latter exports rose to a value of 6,200,000f., of which one-fourth went to Italy and one-fifth to France.

Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.

The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

We purpose making our contest a little more puzzling. 18 correct lists were received for the twelve queries appearing in the Jan. 20th issue. This places us in a difficult position. Who should get the prize?

After deliberation we have awarded the prize to W. O. Bird, Edmonton, Alta. In a previous issue Mr. Bird sent us a correct list of names, but was a few days late in submitting them. We, therefore, think we shall be acting in accordance with the wishes of our readers in sending him the scale on this occasion.

In future contests the following plan will be adopted. We will place the correct lists face down on the desk and allow some neutral party to pick out one of the lists as the winner. This arrangement will eliminate the date and distance problem for all time, and is fair to all.

CONTEST FOR FEBRUARY 10TH ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

1—What to do if accuracy is of prime importance.
2—How to get the highest rate of production with the smallest amount of lost time.
3—A product easily handled.
4—Something that runs in self-oiling bronze bearings.
5—Something that has been absent for some time.
6—How to cut down expense.
7—A product that requires no special fixtures.
8—Something that gives high speed with practically no vibration.
9—A product that keeps primed.
10—A product said to be a big time-saver.
11—Something that refuses to spurt.
12—A product that is both solid and adjustable.

These are Correct Answers for List from January 20th Issue:

1—Walton Co.
2—Wallace Barnes Co.
3—Brown & Sharpe Mfg. Co.
4—National Acme Co.
5—Brown & Boggs Co., Ltd.
6—Jones & Lamson Machine Co.
7—The L. S. Starrett Co.
8—Clemson Bros., Inc.
9—Ritchie Supply Co.
10—Northern Electric Co., Ltd.
11—The Holden Co.
12—Morse Chain Co.

Closing Date for This Contest is March 3rd.

Interesting Examples of Vertical Milling

By J. H. MOORE

EXAMPLES of vertical milling machine practice will be shown in this article, but for the benefit of those not familiar with the particular machine on which these various operations are performed, we will briefly discuss the machine itself rather than the work performed. The type of miller shown at Fig. 1 is known as the No. 8 Herbert vertical mill, and is made in the Edgwick shops of the Alfred Herbert, Ltd., Coventry, England. They have given us the following data regarding these machines:

The spindle has a clutch drive, and an external taper for mounting large face milling cutters. The arbors are secured by a draw-bolt. The power is transmitted to the spindle by two eyes. The gearing can be thrown in and out of action without the use of spanners. For heavy cutting the drive is through a large spur gear. The main spindle bearing is of phosphor bronze with adjustment for wear. The pulley runs upon a sleeve so that none of the pull of the belt comes upon the spindle. The sliding head is balanced and has quick adjustment by pilot wheel for setting and fine adjustment by hand wheel for putting on the cut. The fine adjustment has a large adjustable index disc. The various handles are brought well out to the front so as to be easily accessible. A locking lever is provided for clamping the spindle slide, and a stop with screw adjustment for regulating its position.

The steady bracket for carrying the lower end of the arbor is arranged to swing out of the way when not in use. It has two positions vertically so as to come close to the main table or the circular table, according to which is in use. It may be raised and lowered by connecting it to the sliding head, a convenient device being provided for this purpose. A profiling roller can be attached to the steady bracket when desired. The holder for the profiling roller has screw adjustment for putting on the cut, and is quite independent of the arbor support, which can therefore be used to support the cutter when profiling. All gears are enclosed.

Main Tables

The flush-top table is provided with ample channels for containing and carrying away the lubricant, a covered way being provided from end to end. Both longitudinal and cross movements have self-oiling slides. The transverse slide is guided by a raised tongue in the centre and is held down by gib plates on the outside edges of the base—the guiding of the slide thus being performed by the central tongue, which, being long in proportion to its width, gives a smooth working slide. Automatic feeds are provided both to longitudinal and transverse movements. Both feeds are reversible from the front of the machine and have automatic and dead stops. The dead stops are arranged to act after the automatic stop, rendering it impossible to break anything by feeding into the dead stop. The longitudinal feed nut is adjustable for wear, and the thrust of both feed nuts is taken by ball thrust bearings. The feed is varied by a patent dial feed motion. To obtain any feed the dial is simply rotated until the number corresponding to the feed required comes opposite the pointer, no other moveemnt being required. The various feeds are all obtainable with any of the spindle speeds.

The cross feed and longitudinal feed hand wheels are at the front of the machine, and the hand wheel controlling the vertical motion of the spindle head is brought well out to the front. All three motions can be operated without the workman changing his position. This feature renders the machine particularly suitable for irregular work such as die sinking. All the movements have large, easily read, adjustable graduated index discs.

Actual Work Performed

Having touched briefly on the mechanical features, let us consider various applications of the machine to typical milling work. At Fig. 1, is shown one of these millers machining a die. Most of the dies produced on the machine shown are of the drop forging type, but where a mill is used for continually reproducing dies as they wear out, a special attachment can be attached which works as follows:

First, a wooden pattern is made, and a former is cast from this pattern. Of course the former is a duplicate shape of the die desired, and is so shaped that it can be bolted on an angle plate on the machine, and can be adjusted for height. A guide pin is made to follow the former, feeding by hand automatically, according to the cuts to be taken. This makes it possible to mill a die approximately the same as the former, without spoiling it by relieving too much metal.

Fig. 2 illustrates an example of actual practice in their own shop. The work

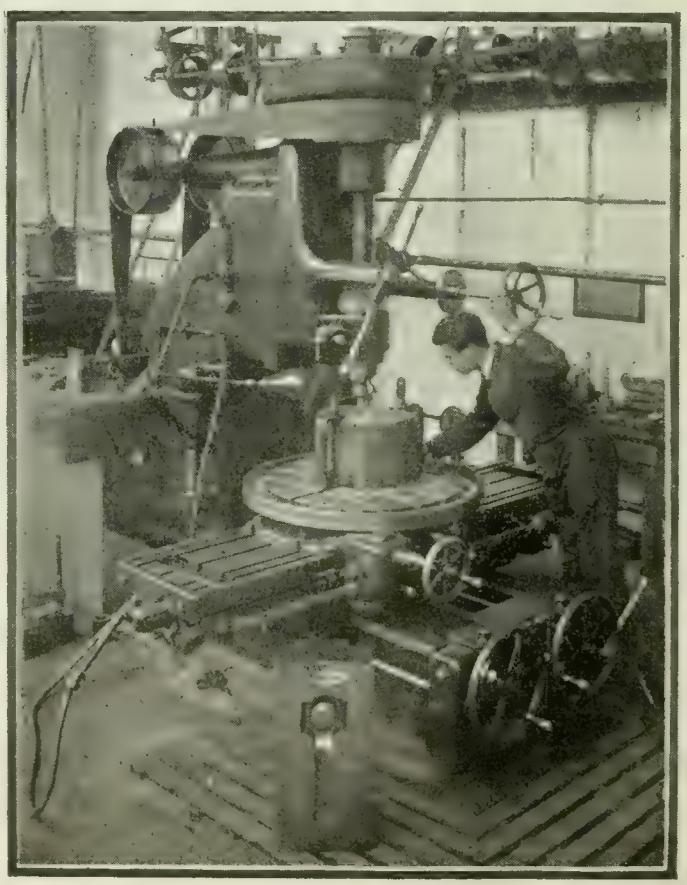


FIG. 1.—DIE SINKING ON A VERTICAL MLLER.

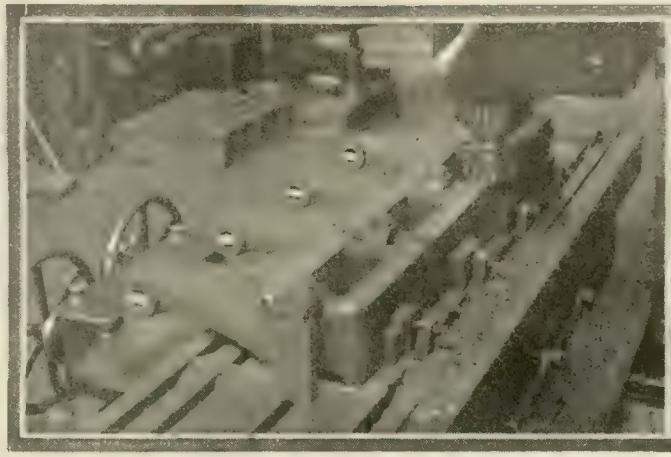


FIG. 2.—MILLING STOP ROD BRACKETS.

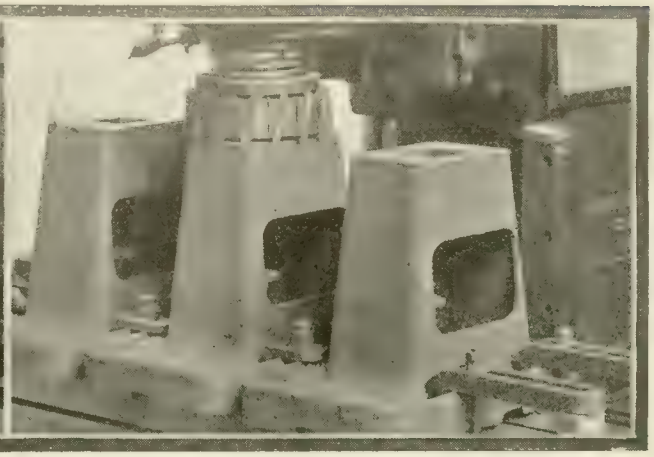


FIG. 3.—MILLING THE TOP FACE OF MACHINE CABINETS.

being performed is that of milling the stop rod brackets for their No. 9 combination turret lathe. It will be noted that the brackets are clamped directly to the table with ordinary shop clamps. The inserted tooth face cutter shown in photograph is 4 inches in diameter, and runs at 57 r.p.m., the feed being 5⅜ inches per minute. About 36 castings are machined on both sides between grindings of the cutter.

Fig. 3 depicts how this concern mills the top of cabinets for their No. 9 turret lathes. These pieces are clamped directly to the table, and are machined with a 12-inch inserted tooth face cutter which runs at 19 r.p.m. A feed of 5⅜ inches per minute is employed.

Another example of Herbert practice is shown at Fig. 4. In this case the operation is that of milling the facings on the sud trays for their No. 1 hexagon turret lathes, and a 12-inch inserted tooth face cutter is used. The cutter runs at 19 r.p.m. and has a feed of 5⅜ inches per minute.

The Last Example

The remaining example is shown at Fig. 5, and depicts the use of the circular table, on top of the regular table. The nature of the work is clearly seen, also the method of clamping. An inserted tooth cutter is used on this work. In conclusion let us quote what this concern have to say regarding the use of this type of machine for die sinking.

"Die sinking is perhaps the most awkward and difficult of milling processes.

"In die sinking the cutters have to be continually changed. Their direction of travel is constantly altering and the depth of cut is continually varying from moment to moment. Whilst the horizontal machine is broadly the machine for straight cuts and repetition work as by gang or form cutters, the vertical machine is to our mind the machine for variety. It will drill holes, mill faces, edges, slots and undercuts. It will mill at the bottom of recesses and sometimes has to perform most or all of these operations on the same article. It is easily manipulated and the cutters are cheap and easily maintained. Vertical milling is usually a cheap operation. Fixtures for holding the work are simple and easy to set; the actual milling being practically continuous."

NEW FUEL

A new compound fuel, named thermalene, has been produced by Karl Wolf, of Zurich. It is a mixture of acetylene and vaporized oils, and is claimed to have important advantages over other gases as a fuel for high temperatures. As now manufactured, the generating mixture, consisting of alternate layers of calcium carbide and crude oil absorbed in sawdust, is packed in tin cans, the largest yielding 200 cubic feet of gas. The addition of water liberates the acetylene, and the heat of the reaction converts the oil into vapor. The two gases are cooled and purified, ready for use in the pipes. The gas mixture is not corrosive or poisonous, has an inoffensive odor and is not liable to cause explosions. At normal temperature, thermalene, which is somewhat heavier than air, is liquefied by a pressure of 1,500 pounds or 1,600 pounds per square inch.

Premises have been leased at Kingsville, Ont., by the McIllroy Belting & Hose Co., Hammond, Ind., for their Canadian branch.

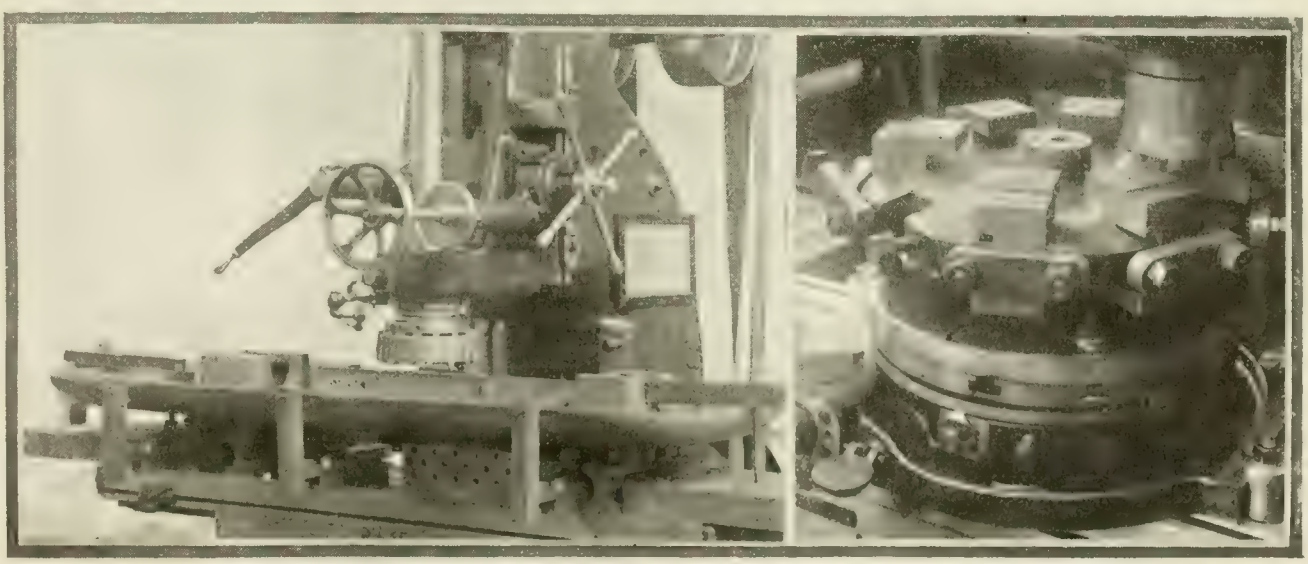


FIG. 4.—MILLING THE FACINGS ON SUD TRAYS FOR TURRET LATHE.

FIG. 5. USING THE CIRCULAR TABLE TO INCREASE PRODUCTION.

The Canadian Welding Society Develops

At the Second Meeting of This Society Nominations for Officers Were Held, Later Plans Arranged and Provisions Made for the Formation of Branches Throughout Canada

THE second organization meeting of the Canadian Welding Society was held in the L'Air Liquide Society offices, Toronto, Canada, on January 26th. Matters of considerable importance were transacted, and the meeting adopted the constitution and by-laws as placed before those present.

Nominations for officers and members of the board of directors were made, with the following results:

For President

A. M. Barry, vice-president, St. Lawrence Welding Co., Ltd.; Prof. H. E. T. Haultain, Mechanical Engineering Department, University of Toronto; W. H. Wood, Canadian manager, Commercial Acetylene Supply Co., Inc.

For Vice-President

F. Borys, commercial manager, L'Air Liquide Society; R. H. Combs, general manager, Prest-O-Lite Co. of Canada, Ltd.; J. F. Crowley, Ontario sales manager, Davis-Bournonville Co.; F. J. Hamilton, manager, Canadian John Wood Manufacturing Co., Ltd.; T. Jones, works manager, Canadian Vickers Limited; H. E. Mussett, sales manager, Canada Carbide Co., Ltd.; C. Royer, manager, Welding & Supplies Co.

For Directors

A. M. Barry, vice-president, St. Lawrence Welding Co., Ltd.; F. Borys, commercial manager, L'Air Liquide Society; A. Girouard, Montreal manager, L'Air Liquide Society; D. N. Griffiths, sales department, Union Carbide Co. of Canada, Ltd.; F. J. Hamilton, manager, Canadian John Wood Manufacturing Co., Ltd.

Prof. H. E. T. Haultain, Mechanical Engineering Department, University of Toronto; J. G. McCarty, Canadian manager, Metal & Thermit Corp.; A. J. MacDougall, vice-president, National Electro Products Limited; S. L. Montgomery, sales manager, Prest-O-Lite Co. of Canada, Ltd.; H. E. Mussett, sales manager, Canada Carbide Co., Ltd.; R. E. Smythies, Engineering Department, Lincoln Electric Co. of Canada, Ltd.

W. F. Thatcher, general manager, Dominion Oxygen Co., Ltd.; R. A. Witherspoon, vice-president and general manager, Canada Carbide Co., Ltd.; W. H. Wood, Canadian manager, Commercial Acetylene Supply Co., Inc.

The elections are to be by letter ballot, everyone sending in his membership application form being eligible to vote at this first election. Application blanks, ballot forms, and information regarding the society are to be mailed very shortly to all those in Canada who should be interested.

The society wishes to point out that it is almost impossible to get in touch with all prospective members. Therefore, no one is to feel slighted if he does not receive further information. Merely write to Canadian Machinery or to the society, and all necessary forms will be sent.

It has been decided to hold the first annual meeting on March 15 in Montreal, and at that meeting the ballots will be opened. This means that all letters should reach Toronto not later than March 13.

One of the most important items regarding the society is the provision made for the formation of sections or branches throughout Canada.

Any group of fifteen or more men eligible for any class of membership may make application for the formation of a section. These sections may be in a city or part of a city or any town, village or part or all of any province or district. In fact, no definite limits are made on geographical location. It is hoped that before the first annual meeting, applications will be received for the formation of sections in Hamilton, Montreal, Toronto, and Vancouver, possibly from others, for there cannot be too many. Anyone interested in the formation of a section should write the society.

The society will place few restrictions on the sections. The main thing is that the section by-laws must not conflict with the aims of the society, and that none of the sections shall develop into labor organizations. The society will refund to each section 50 per cent. of all membership dues received from members enrolled in that section. Also each section will be entitled to elect a member of the board of directors of the society.

The society is to meet twice a year, but no restrictions are placed on the sections. In fact, it is proposed that they meet at least once a month. At these meetings papers may be read from men prominent in the welding industry, discussions may take place regarding the outstanding welding problems, or anything of a similar nature. This phase of activity is left largely to each individual section.

Officers of the society, however, will lend all possible aid to the sections. The secretary will assist in the compilation of by-laws, in arranging for papers to be read, etc. While certain restrictions are placed on members in the various classes in the society, these restrictions do not necessarily need to be included in the section by-laws. Each section is to make its own rules regarding this point.

The greatest latitude is to be given to the sections in the conduct of their own affairs, and it is hoped that all branches and the main body may be able to work together for the general advancement and betterment of the welding industry in Canada.

The meeting held in Toronto, while of necessity somewhat limited as to attendance, showed the strongest interest.

It was also the opinion of those present that while everything could not be done the first year, still the society should be gotten under way without delay and should carry out whatever was possible, and that even the smallest activities would be of benefit.

Those present at the meeting were as

follows: A. M. Barry, vice-president, St. Lawrence Welding Co., Ltd.; F. Borys, commercial manager, L'Air Liquide Society; P. F. Briggs, welding instructor, Toronto Technical School; S. E. Brock, Canadian General Electric Co., Ltd.; J. H. Carson, manager, National Electro Products Limited; R. H. Combs, general manager, Prest-O-Lite Co. of Canada, Ltd.; J. F. Crowley, Ontario sales manager, Davis-Bournonville Co.

D. N. Griffiths, sales department, Union Carbide Co. of Canada, Ltd.; F. J. Hamilton, manager, Canadian John Wood Mfg. Co., Ltd.; L. H. Holman, manager, Engineering Services Limited; Jas. Honan, sales department, Dominion Oxygen Co., Ltd.; E. J. Houghton, sales department, L'Air Liquide Society.

W. M. Leith, sales department, Dominion Oxygen Co., Ltd.; A. McDougall, engineering department, L'Air Liquide Society; A. J. MacDougall, vice-president, National Electro Products Limited; H. T. Madge, oxy-acetylene welder, C. N. R. Leaside Shops; J. C. Minns, sales department, Canadian General Electric Co., Ltd.

J. Moss, advertising manager, L'Air Liquide Society; H. E. Mussett, sales manager, Canada Carbide Co., Ltd.; F. J. Padbury, manager, Toronto Welding Co.; J. N. Robinson, managing editor, Canadian Welding Journal; C. Royer, manager, Welding & Supplies Co.; R. E. Smythies, engineering department, Lincoln Electric Co. of Canada, Ltd.

F. Staddon, sales department, L'Air Liquide Society; A. A. Stewart, secretary, Canadian Welding Journal; J. Sykes, electric welder; L. Sykes, sales department, L'Air Liquide Society; W. F. Thatcher, general manager, Dominion Oxygen Co., Ltd.; F. G. Tripp, Canada Carbide Co., Ltd.; W. H. Wood, Canadian manager, Commercial Acetylene Supply Co., Inc.; D. L. Wright, L'Air Liquide Society.

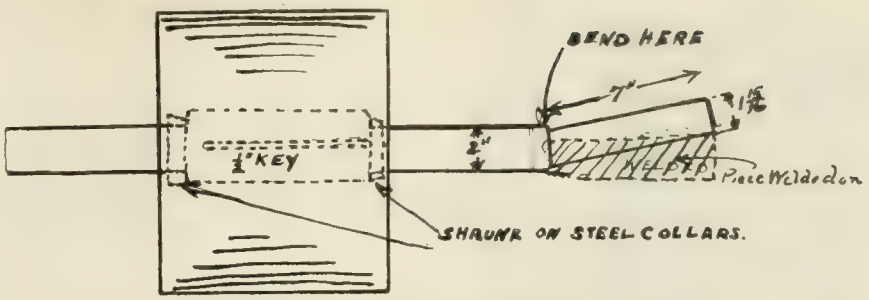


DIAGRAM OF ROTOR AND SHAFT.

STRAIGHTENING ROTOR SHAFT

Recently I was given a job straightening a 2 in. rotor shaft, which was bent right at shoulder on pulley end, and as I thought it would be next to impossible to straighten it without taking shaft out of rotor, and as it is quite a job to take same out and place it again, I did it in novel way, which may interest some of our engineers.

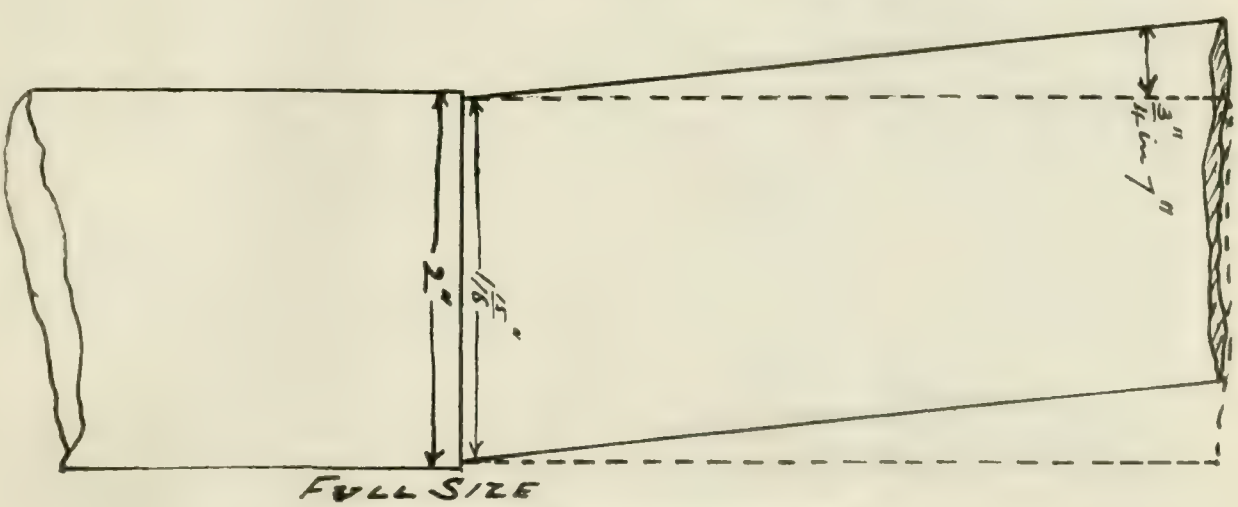
The rotor shaft in question was bent in transit by the railway company and was out about ¾ in. As our readers well know only .008 inch is allowed between stator and rotor laminations, so it is seen that rotor shaft must be perfectly straight.

I did not care to heat it nor hammer it, so we had one side built up with electric arc welding process, then rotor was set up in lathe, welded end in steady-rest, faced and new centre put in, and then shaft turned to 1-64 oversize and then ground to exact size; it was then impossible to tell any defect nor that shaft had ever been welded. Operation took six hours and rotor never got hot enough to melt solder out of rotor rings.

ERNEST QUIST.

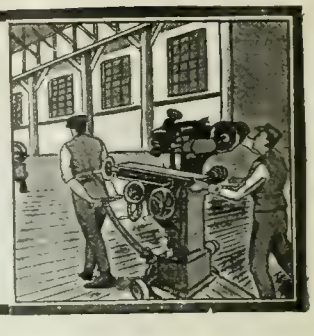
The idea shown above is quite satisfactory as regards truing the shaft. It does nothing, however, to relieve the strain set up on the fibres of the shaft at the shoulder, where it was bent. We think that the rotor could have been protected by a shield from radiant heat and the shaft warmed at the bend by a blow torch and straightened up by pressure. It could then have been heated to a dull red for two or three inches each side of the bend, and allowed to cool, after which it could have been trued up in the lathe. The insulation would not have been damaged in this way, and the molecules of the metal would have been returned to their normal condition. As it is a certain amount of initial stress is present when no load is on the shaft, and this the welding would not help. We would like to hear some opinions from our readers on this.—Editor.

Can you imagine a house built of straw? The French are really thinking of building straw houses to remedy the present housing crisis. The proposal is said to have emanated from an expert in textiles, who has invented a process for making bricks from compressed straw. The framework of the house is made of wood, and the walls are built up of blocks of straw. Owing to the lightness of the material, there is no need for deep foundations, and the whole building can, it is said, be completed in a month. It is stated that the straw preparation is no more inflammable than are bricks. The first straw house has already been built at Montargis, and if it proves a success it is possible that, owing to the rapidity with which such houses can be built, the new invention may be utilized in the devastated regions.



FULL SIZE SKETCH SHOWING AMOUNT OF BEND.

DEVELOPMENTS IN SHOP EQUIPMENT



INTERNAL GRINDING MACHINE

The Heald Machine Co., Worcester, Mass., has added another machine to its present line of grinders. This new machine is known as the No. 80. The front view of the machine is shown at Fig. 1.

The workhead of the machine is driven by a cross belt through the base from a cone pulley giving three speeds. It is arranged to swivel, and is graduated to 45 degrees, or 4-inch taper to the foot.

The main drive pulley is connected to its shaft through a friction clutch and provided with a brake, both of which are so connected with the wheel-slide that when the latter is drawn back both the work and the pump are automatically stopped. At the same time, and without attention from the operator, a small guard swings over the grinding wheel to protect the operator from injury due to accidental contact. No time need be lost in gauging the work, or in substituting another piece for the finished one.

The wheel-slide, or table, is reciprocated by a pinion at the upper end of a vertical shaft, driven through a double friction clutch under control of the operator. By shifting a single lever the traverse is changed from power to hand movement without the possibility of both being engaged at the same time. This enables the operator, as soon as the grinding wheel is clear, to run the slide back quickly for the purpose of gauging or removing the work. This table slides upon flat and V ways. The power traverse may be set to any desired point of reversal. The table drive is through a two-step cone, thereby providing two rates of wheel traverse.

At the wheel end the spindle runs in a bronze tapered bearing that allows for adjustment to compensate for wear. At the pulley end a ball bearing is provided. The wheel-heads are made up as complete units, each having its own pulley, thereby insuring correct spindle speeds. A section through one of these wheel-heads is shown at Fig. 2.

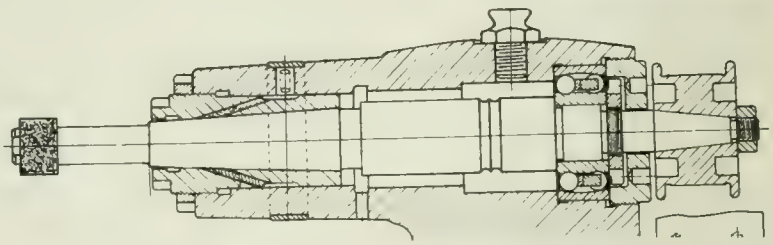
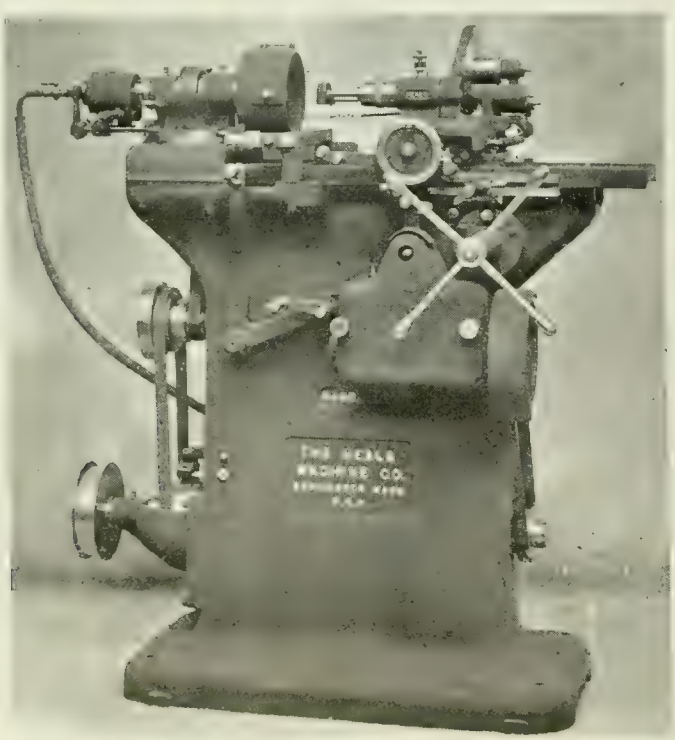


FIG. 2.—SECTIONAL VIEW OF ONE OF THE WHEEL HEADS.

The cross-slide may be operated by power feed or by hand, and the power feed is so calibrated as to work to half thousandths of an inch on diameters. The overhead countershaft, supplied with the machine, has an idler to keep an even tension on the belts.



GENERAL VIEW OF THE GRINDING MACHINE.

MULTIWHIRL COOLER

The Griscom-Russell Company, 90 West street, New York City, manufacture a device for the cooling of oil used in the lubrication of turbine bearings, reduction gears or quenching oil in the heat treating of steel. In either case the oil is constantly circulated through the cooler, thus maintaining the oil at a constant temperature and permitting the continued use of the original quantity of oil and its maintenance at the proper viscosity for efficient results.

The apparatus takes its name from the whirling path of the oil, which path is accomplished by the use of the helical baffle which directs the oil in its flow without appreciably retarding its progress. This baffle also serves to bring the oil into intimate contact with the cooling surface and it insures a high rate of heat transfer.

The shell is of cast iron and the tubes of seamless drawn brass or copper, expanded into a fixed tube plate at one end and into a floating head at the other, which latter permits expansion and contraction without strain on the tube joints.

AUTOMATIC TUMBLING BARRELS

The Ideal Concrete Machinery Co., Cincinnati, Ohio, have placed on the market an automatic tumbling barrel

that is a decided departure from the ordinary style of barrel.

This barrel has the action of the regular type, but it tumbles much faster.

It can be loaded automatically from ground level and discharges the work directly into buckets or buggies, without stopping the barrel. Much time is saved in loading and unloading the barrel, also in tumbling.

The work can be held in the drum as long as desired, and the operator can at all times see the progress of the tumbling, thus ensuring that it will not be over tumbled or not tumbled enough. The barrels can be furnished for exhaust tumbling, wet tumbling, also equipped with slats for separating trimmings. The illustration shows a 36 by 60-inch barrel equipped with exhaust, and these barrels can be furnished in the following sizes: 24-in. x 30-in., 36-in x 48-in., 36-in. x 60-in., 42-in. x 60-in., 48-in. x 60-in.

The shell of the mill is made of ¾-in. steel plate, rolled true to size and butt welded. The drum heads are castings ¾-in. thick and protected from wear by steel bands shrunk around the running track. They are also equipped with ¾-in. removable wearing plates on the inside. The drum revolves on chilled iron rollers 12 inches in diameter. These rollers are rigidly fastened to the roller shafts, which run in flexibly hung Hyatt roller bearings. The journals of the roller shafts are case hardened.

The frame of the machine is built of heavy angle iron, well stiffened with gusset plates and hot riveted. The power loading skip is raised by a 14-inch contracting band hoist and an automatic stop prevents the loading skip from being hoisted too far.

These tumbling barrels are adapted for tumbling bolts, nuts, stampings, drop forgings and small castings, either grey iron, steel, malleable or brass.

ROTARY MILLER

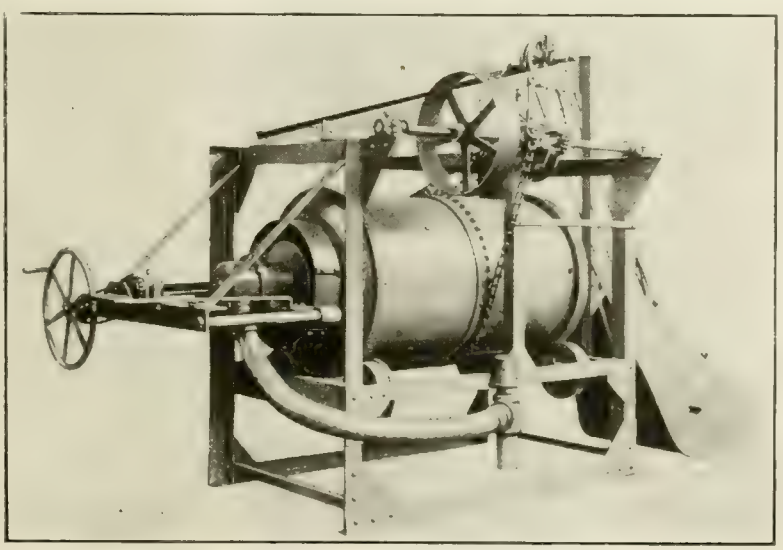
The Craftsman Tool Co., Conneaut, Ohio, have placed on the market a line of continuous rotary millers. These machines are somewhat similar in design, and the No. 3 size, which is the largest, is provided with two rocker arms and driving pulleys. This insures greater power and at the same time enables the operator to make two adjustments for depth of cut and two separate operations can be handled by the machine at the same time.

Parts up to 2½ inches in diameter, and up to 6 inches in length, can be handled on this machine. Thirty feeds are provided, and the machine is equipped with compound feed gears. A glance at the illustration will show the machine's general appearance.

These machines are used for castellating, screw slotting, slab milling, straddle milling, plain milling, etc. The work is milled by being fed into the chuck as it rotates, each jaw being full as it comes under the cutter the operation is thus continuous. As each independent jaw of the chuck approaches the cutter it is closed automatically by the two roller bearings between which it passes. The work at the same time resting upon the central plate is thus held in positive position while being machined. As the work leaves the cutter the chuck in turn automatically opens and the parts drop from the chuck and pass from the machine through a chute which makes the machine semi-automatic.

In castellating the nuts have to pass through the chuck three times but due to the fact that the operation is a continuous one the production is very satisfactory, ranging from 1,200 slots per hour on ½-inch nuts up to 2,100 slots per hour on ¼-inch nuts. This insures a production of 400 to 700 complete nuts per hour.

The machine is equipped with a pump and a lubricant tank in the base. Attached to the right is a metal container for holding the parts to be milled which has a capacity for a half day's run.



GENERAL VIEW OF AUTOMATIC TUMBLING BARREL.

VIEW SHOWING THE CLAMP IN USE.

DRILL CLAMP

The Poyser-Bucher Co., Canton, Ohio, have placed on the market a drill clamp and support, which is shown in the accompanying illustration. This clamp was designed to do away with the use of the gooseneck, or as it is called, the old man, and where is the mechanic who hasn't said things about the old man?

This clamp, by means of one adjustment, will drill a hole in the top, bottom, or web of an I beam, and as the photograph is self explanatory we need say nothing further.

PORTABLE DRILL

The Wodack Electric Tool Corporation, Chicago, have developed a new automatic stop drill.

This portable drill is motor driven, using either alternating or direct current and automatically stops when not in use. This is due to the fact that the current contact functions through a spring lever in the handle which is released as soon as the pressure of the operator's grip is removed, much on the same order as the valve on a pneumatic hammer or on the same principle as the "dead man" grip controller used by the elevated railway system in Chicago.

This drill is the development of fifteen years of experiment and is made in six sizes: 3-16, 5-16, 3-8, 1-2, 5-8 two speed, and 3-4 inches.

In addition to the drill, this concern are manufacturing a portable grinder equipped with the same style of control. These grinders are made in three sizes, depending on the wheel capacity, 3x½, 4x1, and 8x1 inches.

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Know What You Burn

THE throwing of a quantity of magnesium (which had become hard and unfit for commercial use) into the furnace under the boiler in the plant of a Montreal concern resulted in an explosion that caused the death of one man and serious injury to three others.

Cases such as this one are seldom recorded in the annals of industrial hazard, but nevertheless, it exemplifies the great danger that lurks in the wake of the thoughtless or careless actions of persons indirectly responsible for the lives of many others, who, at stated periods, are more or less dependent on one or more men for the safety of their person.

Firemen and engineers in charge of boilers should have a greater sense of their responsibilities than was shown in this particular instance. While greater care must necessarily be exercised in burning the refuse around a chemical plant, the use of the furnace as a receptacle for all kinds of rubbish is a practice that should be strictly guarded against. Unless instructed by the man in charge of the furnace, no one other than the fireman should be permitted to throw any refuse upon the fire. Even though the rubbish be perfectly acceptable as fuel, the opening of the furnace door to throw the material in may result in greater loss than the heat units obtained from the stuff or the convenience of getting rid of it. In the case here cited, the slight damage to the building and the small number of injured persons, was doubtless due to the fact that the shock to the building was considerably lessened by the explosion wrecking the large skylight in the boiler room, thus preventing the full force of the concussion from coming on the more solid portions of the room. Had the boiler been more compact and bricked in, the result might have been more disastrous.

Where it is customary to burn refuse in a furnace the fireman should have full knowledge of what the rubbish consists of and if there is anything there that he has doubts of, it should be his duty to refrain from putting it on the fire. Where a boiler under pressure is concerned it is not well to "take a chance."

The Other Firm

HAVE you heard this phrase any place? "I don't think it's time for us to buy yet," or "I don't think prices are right yet to go ahead with that undertaking."

Of course you have. In fact these twin phrases are becoming so common that they are going to be part of our business vocabulary.

If this attitude is maintained it may be found that it will be a very difficult matter to get started or to go on. The longer that the markets are left alone the harder will it be to get service.

It is time that we started thinking about the other man's business and interests a little. Would it do any particular harm, for instance, to stop and think some day that your business would be as good as a spring tonic now to the firm you were thinking of ordering from?

Suppose half a dozen firms, thinking of making purchases in the machine tool market, should drop in and remark that they were ready to go ahead now, believing that prices were fairly well on the way to a basis where they would stay for some time. Don't you suppose it would have an influence on the trade?

It is a dangerous thing to withhold your business too long.

Right now, by making a sacrifice to go ahead with some line of work, you are serving a double purpose. You are getting something necessary done and at the same time you are doing a good service to other lines of industry that need orders now.

It won't hurt you a bit to think a little about the interests of other people this year.

The Strikes of the World

WE read of a little strike here and others there and to some extent we have seen the local waste of these movements. It is not often that a person has the opportunity of taking a world-wide view of the situation and getting some idea of the strike waste of the entire world for a given period.

Most of the figures given below are from the Manchester "Guardian," and although they cover the ground fairly well, there are no doubt many hours and days that could be added.

These figures are for the first six months of 1920:—

Country—	Persons Affected	Days Lost
Germany	1,866,358	18,201,660
Italy	1,781 250	21,650,200
France	1,186,670	19,358,400
Great Britain	1,117,040	6,926,900
U.S.A.	958,700	11,287,400
Spain	724,700	11,630,100
Australia	303,400	7,602,000
Sweden	180,070	4,779,170
Belgium	176,940	2,096,340
Austria	97,540	902,900
Egypt	95,000	441,000
India	90,000	1,780,000
Poland	81,000	429,900
Switzerland	73,380	2,753,160
Holland	63,000	795,300
Argentina	61,100	659,400
Balkan States	45,000	2,176,000
South Africa	41,000	809,000
Denmark	17,200	241,800
Portugal	13,150	235,050
Czecho-Slovakia	3,800	29,300
Norway	1,400	28,000
Ireland	100	2,000
Total	8,977,798	114,814,980
Industries—	Persons Affected	Days Lost
Mining	1,631,100	20,831,800
Iron and metal	1,377,830	20,791,850
Textiles	303,500	4,441,200
Timber	242,840	3,932,340
Stone	61,900	775,200
Leather and paper	40,080	624,620
Building trades	808,000	15,004,000
Tailoring and cleaning	160,500	2,467,300
Food and luxury	248,814	3,779,520
Printing	48,200	498,200
Shipping	1,540,174	17,454,050
Chemicals	269,900	5,566,800
Steel	184,110	1,072,560
Agriculture	1,975,800	16,819,000
Unenumerated	85,050	756,540
Total	8,977,798	114,814,980

The Fundamental Conditions Are Sound

"ONE thing that has impressed me is the fact that buyers who are placing business now are taking advantage of discounts. They have the money at their disposal and I believe when they are satisfied that prices are right they will buy."

That is a report from the machine tool trade this week.

Another—One of the offices in the steel trade that handles a nice big tonnage every year reports a large number of inquiries, very few of which have been turned into orders. They are not being withdrawn, but they are going to be gone on with as soon as prices come within the estimate they have in mind on what the undertaking will stand.

Some of these inquiries are not new. They have been in the market before and are put in again now with the idea of finding out if there is any improvement in the situation.

But they come from a very wide range of industries. They call for structural shapes, bar mill products, sheets, ties, etc. The people asking for these prices are not concerned in the matter simply from the point of securing quotations for the sake of knowing market tendencies. They could get this information with much less effort.

They are following the markets because they have plans in mind, and they stand ready and prepared to launch them just as soon as they believe it will be to their advantage to do so. These inquiries represent definite future business and although an office may get a bit tired at times of nursing these along, the real salesman never discounts the importance of them.

Just this week Canadian Machinery asked W. H. Whitaker, of the Goold, Shapley & Muir Co., Brantford, if there was anything on the business horizon of his company that he could interpret as pointing to a more favorable business tendency.

Mr. Whitaker admits right at the start that it is quite a proposition "to give you optimistic material to sow broadcast in the hearts and minds of the general public, particularly to some person who is trying to sell the farmer something that he does not now need and which he seldom, if ever, buys in January and February."

On top of this, Mr. Whitaker seems to nurse an opinion that the farmers—perhaps through the U.F.O.—are engineering a buyers' strike. In other words they are not lugging home as many gas engines and windmills as they should.

But let it pass at that. When the Brantford manufacturer gets over his preliminary hurdles he has this to say:

"Even at that, our sales organization in Eastern Canada here did more business during the month of January, 1921, than we did in January, 1920. We are not blowing about it, because we did not do very much business in either period, but all these difficulties to the contrary, this Canada of ours is the best ever.

"The fundamental, underlying conditions for prosperity are sound and before 1921 lapses we are going to see, in the writer's judgment, a return to normal business and conditions, when, if we are industrious and thrifty, we are likely to be happy and some of us are going to be happy even in the meantime—and we all should be."

Another manager, speaking of this same condition, states his belief in the fact that "we have seen the worst. We can tell it in our own business. It may seem poor optimism to tell you that things are not getting any worse, but it is an absolute way of looking at the case. We do not deny that business is below normal, but we know from a close scrutiny of our records that the bottom of the hill has been reached. It is going to be slow going up for a while, but it is sure and certain. If there is any optimism of the worthwhile kind in that, you are welcome to it."

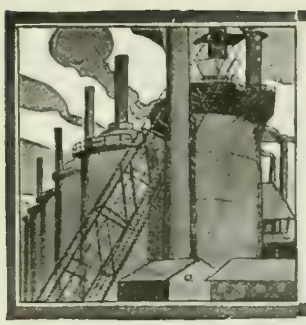
The cartoon on this page gives the idea. It is worth looking at. The traffic cop "Optimism and United Effort" can put his hand up and stop Old Man Gloom better than any other force that can be brought to the rescue and these forces can also take the hand of the rather timid chap "Business" and get him across the street in safety.

The more people who get out and get in behind that cop the bigger and stronger the officer will be and the less chance of the lad "Business" getting run over.

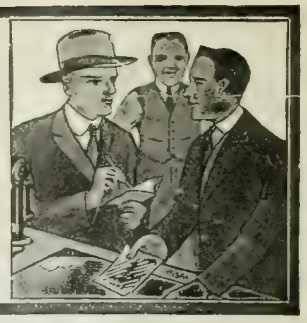
Now, then, let's get out and help that cop.

THE NEW TRAFFIC COP

—Toledo "News-Bee."



MARKET DEVELOPMENTS



Trade Quiet In Most of the Markets This Week

Pittsburgh Reports Production Easing Off Even at Some of the Corporation Mills—New York Machine Tool Market Still Has Resales on Hand—Many Inquiries in Toronto District

THE machine tool markets are not making any rapid move toward recovery. Inquiries continue to hold first place over actual orders taken. Dealers report that some sales are being made and one of the signs they consider very encouraging is the way in which settlement is made for sales made. There seems to be enough capital to take advantage of all the discounts.

The exchange problems between various countries continue to be a source of bother, particularly as the machinery of several nations is finding its way to the Canadian market again after an absence of some years. The belief is expressed that there will continue to be a certain amount of instability until such time as arrangements are made to stabilize the value of the currency of the world.

The steel market is quieter than it has been for months. January was somewhat of a disappointment to the warehouses, although a large amount of material came into the country to actual orders. Some of this material has been on the books of the Steel Corporation for over 14 months and it is considered a favorable sign that it has stayed "good" all this time.

Steel merchants are concerned just now with getting rid of their surplus stock. They are drawing on their present stocks almost entirely. Some of the trade that should be good this time of year is being curtailed. Earlier in the season several firms send in orders for boiler tubes and have since cancelled or cut down, with the result that several yards have more tubes on hand than they had bargained for.

The scrap metal market remains inactive, but dealers generally look for a recovery in copper before the iron and steel varieties pick up, basing their belief on the ground that right now red and yellow metals are being sold for less money than it takes to produce them.

MONTREAL TRADE SHOWS NO CHANGE—BUYING IS STILL SMALL

Special to CANADIAN MACHINERY.

MONTREAL,—Feb. 10, 1921. — Analyzing the present industrial situation brings out the fact that the physical features of business have changed but little, but the process of fusing the component factors is proceeding slowly, but surely. Business shows slight fluctuations, inasmuch as some plants are curtailing operations while others, particularly the smaller shops, are reporting better conditions and more work.

Prices Steady on Light Demand

"There has been no change of late nor do we anticipate any marked departure from the present activity for some weeks or perhaps months." This impression of one dealer is, apparently, general among steel men throughout the district, although none of them seem disheartened over the prospect. As this particular dealer stated:—"Our business is quite satisfactory, and while we cannot say we are rushed with orders, we continue to do a steady trade from the warehouse, not heavy it is true, but in face of existing conditions there is little to complain of. There are very few in the steel business, to-day, that did not foresee such a time as the present, and there should not be many that are seriously put out by the temporary falling off in demand for steel commodities. This depression had to come and it will eventually prove to re-establish business on a saner and more healthy foundation." The feeling is still prevalent among many users of steel that lower prices will be a development of the spring business, and it is thought that the leading mill interests in the States hold the key to the situation, and if the Steel Corporation sees fit to readjust the wage scale, to provide lower selling figures, the general lowering of prices will be a logical consequence. There has been no price changes in the local market and those quoted are quite firm, even though business is not brisk.

Exchange Absorption Quite General

"Inquiry is such as would lead one to believe that business is pending, but the actual sales resulting from these leads are relatively small." This is how one of the local dealers sized up the situation, and remarks of others are along the same lines. Some of the smaller dealers require to keep hustling to maintain business on a paying basis, but some of the larger houses report fairly good returns from salesmen's efforts, although the volume is not heavy. The supply end is most active but occasional placements for large tools are made. Hope was expressed that the railroads would be in the market for equipment, but this, apparently, has been deferred for some months. The absorption of the exchange or some part of it is now more general among American firms doing business in Canada.

Buying Only What They Need

Dullness in old materials continues as a feature of present trading. Local dealers see little in current inquiry that would give the impression that the early future would see any marked improvement over past weeks. "We cannot say we are discouraged, although business is not sufficient to meet running expenses, but this period through which we are now passing had to come some time and the sooner we accept this the sooner will the time come when normal conditions will be resumed." The inactivity of many plants, particularly in the metal working industry, has reacted on scrap metals and the volume of business now carried on is exceptionally light. "The quoting of prices," said the dealer, "matters very little just now, as this factor seldom influences the trade. Material is acquired only when needed and they pay the price asked." Slight revisions, downwards, have been made in old material prices. The quotations, however, can only be considered as nominal.

BELIEVE WORST HAS HAPPENED

Inquiries Are Becoming More Numerous, but the Orders Are Not Being Closed

TORONTO.—There is this to be said, there is still money in the country. A machine-tool dealer mentioned this morning that he had made some sales during the month just closed, and when it came to terms and settlements he was surprised to find that in all cases they were ready to take advantage of all the discounts.

Those who study the markets closely, and take in all the conditions they can find, believe that the matter of international exchange has more to do with business than anything else. "We will have to arrive at some understanding before we can get very far in any one direction," was the opinion of a large dealer this week. "Now that other countries are getting in shape to put their products on this market we find that we are more or less at sea in figuring out where they stand in our money and what we can do to meet their prices. This tendency is likely to become worse instead of better."

Most of the houses that sell in this market have fairly large stocks on hand just now, and in that way are able to make very quick deliveries in almost any line that may be called for. In fact some of them have stocks on hand that are away and above anything previously carried.

Some of the offices report that inquiries are coming in more frequently, but they are not being turned into actual business at anything like the rate the dealers would like to see. The railroads have been buying very sparingly, considering the fact that general impressions led the trade to believe they would be in the market for good-sized lists.

Dealers do seem to agree on one thing, viz., that the worst has happened in the trade in this country, and from now on there should be some form of recovery, although they claim this is going to be more gradual than they had hoped for, and it may take some time before a normal amount of business is coming their way.

In Small Amounts

Dealers in small tools are looking for something a little better after a number of firms have finished taking their annual inventories. Stocks have been allowed to run down without any replacement buying being done. One of the dealers claimed that it was becoming an obsession with some firms to buy from hand to mouth. There were fairly large concerns sending the boy down now for one or two drills of a certain size which they wanted to do some special job that had turned up. Hardware stores that carry small tools are doing the same thing and are drawing in small lots on the dealers rather than buy up a larger stock. Prices of small tools are unchanged.

Tool steels are easier in price, and shipment on English steels is very prompt. The English makers are preparing to make a bid for the Canadian market. One report this week tells of a small piece of very special steel being ordered and delivered in less than four weeks, and the claim is that this time is being made on a number of orders that are going over now.

In the Steel Market

The average steel merchant is out to sell now, and not to buy. He is taking in small shipments of such lines as he may need, but in the main he is out to get his stock down. The past season has been a peculiar one, and the element of speculation entered more into the trading than ever before. Steel merchants had the option of buying in the spot market or doing without, and every time they took on a shipment of premium material they increased the element of speculation in their business, and the chances of getting caught with a loaded warehouse when the drop in prices came. Getting rid of stock is the big consideration just now. One of the dealers stated to Canadian Machinery this morning, "You can call it what you like, but as far as our own case is concerned we are trying to liquidate, and that word expresses it best of anything. Not that we have been caught overloaded, but we must get ready to do business on the new levels."

A case in point indicates how some of the firms have been waiting for deliveries from the Steel Corporation. At one of the warehouses this morning they were unloading small channels and angle iron that had been booked over fourteen months ago. The fact is that shipments of this can be had at comparatively short notice now, and it looks as though the corporation were out looking for business.

"One of the best features we find in connection with our business just now," stated another dealer, "is the way in which business has stayed sweet on our books waiting for delivery." This office reported that shipments of over a half million dollars worth of business had gone through in the month of January, and much of it had been waiting for months.

There are a number of inquiries in some of the steel offices, some of them for very fair tonnages, and representing a very wide range of operations. It is hard to tell exactly how much of this is going to be turned into real business, the dealers themselves believing that much of it is sent out to try out the market, and find whether there has been any improvement over a figure that may have been secured a few months ago. It indicates a willingness on the part of the buyers to come into the market when they consider that things have reached the proper stage.

Seasonable buying is not up to the old market in the steel trade this year. For instance, the boiler tube trade has been more or less of a disappointment. Firms earlier in the season gave fairly large orders for repair work, but since then they have cut their orders severely, and many warehouses are left with the goods on their hands.

Scrap Market the Same

Nothing has developed to change the scrap metal situation. Prices are away down, but even so they are only nominal, and can hardly be put up as absolutely

POINTS IN WEEK'S MARKETING NOTES

Pig iron is now being quoted in Toronto district at $39.25 for No. 1. This price has been made necessary owing to the low prices quoted by the United States furnaces.

Material was being taken in at some of the Toronto warehouses this week that had been ordered from the United States Steel Corporation over fourteen months ago.

New York machine tool markets show very little improvement and a number of resale machines are still on the market there at quite a reduction from previous prices.

A large number of inquiries have been received by the steel trade in this district. Some of them undoubtedly are for the purpose of comparing present prices with quotations previously made.

There is no improvement in the scrap metal trade, although dealers look for an improvement in copper. They claim it is now being sold at a price below the cost of production.

Most of the steel merchants are engaged just now in getting rid of as much of their stock as possible, and are taking in very little material.

The sale of boiler tubes has been somewhat of a disappointment this year. Earlier in the season fairly large orders were placed, but these have since been curtailed considerably.

Some sales of pig iron have been made by United States producers at as low as $29 and there seems to be a move under way to force the price to $25.

correct, because there is no trading, and trading is the one thing most necessary to establish a price. "We look to see reds and yellows coming back soon," was the view of one dealer this morning, "because right now coppers are selling below what it actually costs to make them. In other words, copper in ingots cannot be turned out at to-day's prices. On the other hand, iron and steel are still money makers and their sale price includes a margin of profit—in some cases a very good margin. Copper has had its bumps and is due to come back. That movement may start very shortly, although I am free to say there is nothing so far this week to indicate that recovery is near."

PIG IRON SELLS NOW AT $39.25 TON

Furnaces Still Working From Old Materials That Were All High-Cost

Pig iron is now being quoted at $39.25 in Toronto—that is for No. 1 foundry. The last price was $43.65, and the price above that was over the $50 mark.

Working as they are from old materials the chances are that the makers of pig iron in Canada are not making much money out of the new price. They are using ore that came down last season and the same can be said of their coal and coke. Were they able to take advantage of present-day prices they would be able to go ahead on a much more satisfactory basis. For instance, the present price of Connellsville coke is around $5.50, while it is certain that Canadian stacks are melting with coke that has cost them well above that figure.

Pig iron is being sold on a smaller basis than usual. Firms are buying in 50-ton or car lots, and are not stocking for future usage.

MANY RESALES ON NEW YORK MARKET

Machine-Tool Trade Is Making a Slow Recovery in a Listless Market

Special to Canadian Machinery

NEW YORK, Feb. 10.—The machine-tool industry is making a very slow recovery from the period of depression, which apparently has passed its worst stage. There has been for a few weeks a slight betterment both in inquiries and orders, but the total volume of orders being booked throughout the country is far from what might be termed a normal business.

Of course, the real reason for the failure of the machine-tool trade to pick up, as some expected it would about February 1, is that many manufacturers who use machine tools are still in that position where they have more shop equipment than they can keep busy. Moreover, the credit situation is not clearing up as readily as was hoped for, and on many of the current purchases time payments are asked for even though the total amount of the purchase does not run into large figures.

Much of the current business is in the nature of "bargains." Used machines and new machines offered for re-sale are being sold much more freely than are machines to be shipped from manufacturers' plants. Quite a number of brand new machines are on the market at prices at least 25 per cent. below those quoted by the machine-tool builders. Many of these machines were bought for export and the orders were cancelled before the machines left this country. In cases where the tool builders declined to accept cancellations the tools are being offered for sale.

While there is some improvement in the demand for tools, the closing of orders is still rather difficult. In this the competition of used tools and the re-sale of tools, mentioned above, is a factor.

Many machine-tool builders in this country are still carrying large inventories of raw materials, finished and unfinished parts, castings, etc., and the question of making reductions in selling prices to attract new business is of vital importance to them. Drastic reductions would cause some of these companies a loss too large to be borne; hence the hesitation about making price adjustments which buyers seem to expect without taking into consideration all of the facts.

STEEL MILLS FINDING SOME OF THEIR COLLECTIONS VERY SLOW

Special to Canadian Machinery

PITTSBURGH, Feb. 10. — Production of pig iron is down to a rate of about 27,500,000 gross tons a year, this comparing with a rate of about 28,700,000 tons in January, 32,150,000 tons in December and 36,850,000 tons in the year 1920 as a whole.

Actual productive capacity may be estimated at 45,000,000 or 46,000,000 tons a year, so that the present rate of operation is about 60 per cent. of capacity. In one way this is a low rate, but it must be remembered that a number of times operations in the iron and steel industry have gotten down to 60 per cent., and merely in a time of ordinary depression or relaxation, without there being such great unsettlement in the world as now exists.

Just now there is no occasion to think of the rate of production increasing. There is no sign that it is going to do that in the near future, or until fundamental conditions have greatly improved. Rather the trend is very decidedly downward, and unless there is a complete reversal in affairs there will be a much lower rate in the course of the next two or three months. Very likely there will be some improvement in demand here and there, but the rate, as a total, will decrease. Only a small proportion of the merchant furnaces are now in blast, so that there is not much room left there for decrease. As to the furnaces of independent steel works, they are, as a whole, running a little better than the attendant steel works, so that there may easily be some decrease in that quarter. The great point, however, is the Steel Corporation, whose operations have been altogether phenomenal. The corporation is running about three times as great a proportion of its capacity as are the independents, and that, of course, cannot continue indefinitely. It is a marvelous thing that while four months ago the independents began to decrease production on account of the supply of specifications beginning to run thin, the corporation has in those four months operated at a higher rate than it did in the preceding four months. In December the Steel Corporation blew in five blast furnaces and blew out one, while in January it blew in two and blew out one, so that it is now running five more furnaces than at the close of November. At some time, and probably very soon, the Steel Corporation's production of pig iron and steel will begin to fall off sharply.

While the present rate of pig iron production, 27,500,000 tons a year, is only 60 per cent. of existing capacity, it is just equal to the output in 1910, which was 27,300,000 tons, while that was approximately the full capacity in 1910. There was sustained demand throughout the year, largely against old contracts. All the consuming industries were working well and requiring more iron and steel than ever before. Now there is not a consuming industry that is in anything like normal position.

Prices

Foundry pig iron has been offered by producers on the basis of $29 valley, or $1 under the market as previously quoted. Nothing at all has occurred in Bessemer and basic, which accordingly remain quotable at $32 and $30, respectively, at valley furnaces. All these prices, however, are nominal. An actual inquiry for a few thousand tons would undoubtedly bring out lower quotations, but no one is disposed to inquire.

Pig iron is simply unsaleable. The furnace men do not know whether consumers would be interested at any price at all, but some of them would like to develop this matter. Production cost is, of course, vitally involved. With costs as at present the furnaces might shade these prices a trifle, but not much. The

furnaces have not much leeway now that the market has declined as far as it has already, most of the production cost being involved in the costs of the raw materials. Two or three of the coke operators, perhaps more, are alive to the situation and are desirous of co-operating with furnace men to get costs down, expressing their willingness to figure out coke prices afresh, even when regular contracts are in force, if the furnace men can get other items of cost down so as to make much lower prices for pig iron and try whether such prices will enable pig iron consumers to get started consuming.

With the exception of plates, prices of finished steel products are well held at the Industrial Board level. In several of the commodities there is some shading, but not a great deal. The steadiness of the market does not betoken any real strength in the situation, the cause of the steadiness being rather that there is so little inquiry of a regularly competitive character that producers are not encouraged to name cut prices. Plates have been sold at 2.50 cents, against the Industrial Board price of 2.65 cents, and more orders could be placed at 2.50 cents, though it is to be noted that the Steel Corporation and some of the independents are adhering strictly to the 2.65-cent price. Other commodities may be quoted at Industrial Board prices as follows: Bars, 2.35 cents; shapes, 2.45 cents; standard steel pipe, 57½ per cent. basing discount; plain wire, 3.25 cents; wire nails, $3.25; blue annealed sheets, 3.55 cents; black sheets, 4.35 cents; galvanized sheets, 5.70 cents; tin plate, $7 per base box, 100-pound.

The Future

At the beginning of the year there were some predictions that the demand for steel products would experience a marked improvement about the second half of March, and that there would be fairly full demand by September or October, though these predictions were not made universally. Now, however, the predictions are less hopeful. There are practically none who definitely predict full employment even late this year.

Several causes brought about this change in expectations. One is that the price readjustment is not proceeding as rapidly as was expected. Observers took their cue from the declines in certain quarters, assuming that others would follow, but now it is seen that the lead is not followed as was expected. To illustrate, long ago clothing experienced sharp reductions, but groceries are not down in proportion even now. The wholesale price of pork dropped below the pre-war price, but the retail price has undergone little reduction. Then, coming home to steel, the independent steel producers came down to the Steel Corporation or Industrial Board level before the end of last year, but the prices of many finished wares produced from the regular rolled products have not declined in proportion. In the past week chain has been reduced from 7.25 cents to 6.75 cents base, with a decrease in the extra for the smallest sizes of .75 cent, but chain is still high relative to its raw materials, wire at 3.25 cents, rods at $57 and bars at 2.35 cents.

Partly on account of this slowness in price readjustment the expectation of broadening in demand for steel must be deferred. Another influence is the unsatisfactory credit situation, capital being scarce and borrowing difficult. The steel industry, which usually does a cash business, with excellent collections, now finds collections very poor in some quarters.

MEN EXPECT CHEAPER LIVING TO KEEP UP WITH THE LOWER WAGES

Sydney, N.S.—Two thousand four hundred men are employed daily at the steel plant, compared with four thousand when the full staff is engaged. Three mills are operating, plate, blooming and billet.

An official stated that no new orders had been received and the outlook was none too roseate. However, the company is seeking business and it may be that should nothing new be booked word may be received from Montreal to manufacture stock which would be kept on hand until called for.

Saturday saw the last day of the first week at the plant under the new wage scale, marking a cut of 20 per cent. on the wages of "all employees of the Dominion Iron and Steel Company," according to the circular posted on January 8. The big drop of one-fifth of the total earnings of the workmen has not yet been felt except through the partial idleness up to now. The first pay envelopes with the new wages will be distributed in the course of this week and a true expression of the effect can hardly be estimated yet.

Employees spoken to are strangely silent on the subject. They seem to have nothing to say but their attitude seems to be that they have to put up with the situation, the only alternative being idleness.

There is no one who seems to think that the wages he has received has provided him with a margin with which to meet the sudden severe cut in income, and the general expression is that unless the promised reduction in costs of living at once takes place, it means privation this winter. The workers do not pretend to be able to keep up present expenses with only the new rates of wages to see them through. They are hoping for relief.

MAY ESTABLISH STEEL INDUSTRY ON THE PACIFIC COAST SOON

Establishment of a large iron and steel industry in British Columbia backed by British capital has been announced. A recent issue of the British Columbia Gazette carried the notice of the formation of the Coast Range Steel, Limited, with an authorized capitalization of $15,000,000. The promoters claim that within the next few years $50,000,000 will be spent in establishment of a great steel industry on the lower mainland of British Columbia. They expect to start active construction of the plant within six months. Five Vancouver men have been named as provisional directors.

Three years ago the British Columbia Government offered a bounty of $3 a ton on pig iron produced in that province from native ore. After investigating the standing of the interests behind the Coast Range Company, the B. C. Government passed an order in council sanctioning an agreement between the Minister of Mines and the company. The British engineers have been investigating the adequacy of raw material resources and they have evidently made a favorable recommendation to their principals.

The period of reconstruction will be three years, during which $15,000,000 will be spent, so the industry cannot avail itself of the provincial bounty until the end of that time. Meanwhile preliminary work is being pushed. The location of the plant has not been definitely decided, according to men interested in the project, but the lower mainland appears to be the likely district for the site.

Mr. Henry J. Landahl, of Vancouver, one of the principal directors, declared that the $3 bounty on pig iron was a great inducement for the British interests. "If we have resources of iron, coal and limestone in British Columbia in quantities large enough to maintain an iron and steel industry, and of such quality as to insure our successful competition with the world, then it is assured that all the money necessary to create this industry is available," said Mr. Landahl.

"We are optimistic enough to expect that the time will come when British Columbia will take care of the iron and steel trade around the Pacific."

Open New Office.—The Black & Decker Mfg. Co. have secured the services of A. J. Hopkins, who will act as their Canadian representative with offices at 392 St. James St., Montreal, Canada. Mr. Hopkins is well known to the automotive trade in Canada and is chairman of the Canadian Auxiliary of the Automotive Equipment Association.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$32 46
Lake Superior, charcoal, Chicago	40 50
Standard low phos., Philadelphia	33 25
Bessemer, Pittsburgh	33 96
Basic, Valley furnace	30 00
Toronto price:—	
Silicon, 2.25% to 2.75%	39 25

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 75
Steel bars, base, Toronto	4 75
Iron bars, base, Montreal	4 50
Steel bars, base, Montreal	4 50
Reinforcing bars, base	4 75
Steel hoops	6 00
Tire steel	5 00
Spring steel	8 00
Band steel, No. 10 gauge and 3-16 in. base	5 50
Chequered floor plate 3-16 aud heavier	7 50
Bessemer rails, heavy, at mill	2 35
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	3 50
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	5 00
F.O.B. Chicago Warehouse	
Steel bars	3 48
Structural shapes	3 58
Plates	3 78
Small shapes under 3-in.	3 48

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

METALS

	Gross. Montreal	Toronto
Lake copper	$19 00	$19 50
Electric copper	18 50	19 00
Castings, copper	18 00	19 00
Tin	44 00	46 00
Spelter	8 00	9 00
Lead	7 25	8 00
Antimony	8 00	9 00
Aluminum	34 00	35 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 5 50	$ 5 50
Plates, ¼ up	5 00	5 50

PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

	Steel		Gen. Wrought Iron	
	Blk.	Galv.	Blk.	Galv.
¼	$ 6 50	$ 8 50	$.....	$.....
⅜	5 31	7 41	5 91	8 01
½	5 31	7 41	5 91	8 01
¾	7 10	8 63	7 95	9 48
¾	8 80	10 87	9 95	12 02
1	13 01	16 07	14 71	17 77
1¼	17 60	21 74	19 90	24 04
1½	21 04	25 99	23 79	27 84
2	28 31	34 97	32 01	38 67
2½	44 75	55 28	....	....
3	58 52	72 29	....	....
3½	74 06	90 62	....	....
4	87 75	107 37	....	....

Standard Lapweld Pipe

Per 100 Ft.

	Steel		Gen. Wrought Iron	
	Blk.	Galv.	Blk.	Galv.
2	$32 01	$ 38 67	$35 71	$42 37
2½	48 26	58 79	54 11	64 64
3	63 11	76 88	70 76	84 53
3½	75 90	92 46	85 10	101 66
4	89 93	107 55	100 83	120 45
4½	1 05	1 29	1 30	1 54
5	1 22	1 50	1 52	1 80
6	1 58	1 95	1 97	2 33
7	2 06	2 53	2 53	3 01
8L	2 16	2 66	2 66	3 16
8	2 49	3 07	3 07	3 64
9	2 98	3 67	3 67	4 36
10L	2 77	3 41	3 41	4 05
10	3 56	4 39	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

	Montreal	Toronto
Copper, light	$10 50	$ 9 00
Copper, crucible	13 00	11 00
Copper, heavy	12 00	11 00
CCopper wire	12 00	11 00
No. 1 machine composition	13 00	9 75
New brass cuttings	7 00	8 00
Red brass turnings	8 00	8 00
Yellow brass turnings	7 00	6 00
Light brass	5 00	5 00
Medium brass	6 50	6 00
Scrap zinc	5 00	4 00
Heavy lead	4 50	4 00
Tea lead	2 50	2 00
Aluminum	15 00	10 00

	Per Ton	Gross
Boiler plate	$11 00	$12 00
Heavy melting steel	15 00	14 00
Axles (wrought iron)	25 00	20 00
Rails (scrap)	15 00	14 00
Malleable scrap	20 00	20 00
No. 1 machine cast iron	30 00	25 00
Pipe, wrought	8 50	8 00
Car wheel	30 00	25 00
Steel axles	20 00	18 00
Mach. shop turnings	8 00	6 00
Stove plate	23 00	20 00
Cast boring	8 00	7 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	Net list
Carriage bolts, ⅜" and less	15
Coach and lag screws	—20
Stove bolts	55
Wrought washers	—25
Elevator bolts	Net
Machine bolts, 7-16 and over	—5
Machine bolts, ⅜-in. and less	—30
Blank bolts	Net
Bolt ends	—5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	Net
Machine screws, o. and fil. hd., brass	Net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 25
Nuts, hex., tapped	add 2 75
Copper rivets and burrs, list less	10
Burrs only, list plus	35
Iron rivets and burrs	37½ and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	67½
Wood screws, flat, bright	67½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	Less 40%
Square and hexagon head cap screws	Less 30%
Round head cap screws	Plus 10%
Fillister head cap screws	Less 10%
Flat head cap screws	Net list
Button head cap screws	Plus 10%
Studs	Less 20%
Semi-finished nuts up to and including 1-in.	Less 35%
Semi-finished nuts 1⅛ to 1½"	Less 30%
Semi-finished nuts 1⅝ to 2 in.	Net list
Coupling bolts	Plus 10%
Taper pins	Less 40%
Planer bolts without fillet	Plus 40%
Planer bolts with fillet	Pus 50%
Patch bolts	Plus 80%
Hollow set screws	Plus 20%
Thumb screws	Less 35%
Thumb nuts	Less 65%

BILLETS

F.O.B. Pittsburgh.

	Per gross ton
Bessemer billets	$43 50
Open-hearth billets	43 50
O.H. sheet bars	47 00
Forging billets	48 50
Wire rods	57 00

NAILS AND SPIKES

Wire nails, base	$5 25
Cut nails, base	6 70
Miscellaneous wire nails	50%

ROPE AND PACKING

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 26
British Manila rope	0 20
New Zealand hemp	0 20

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	Net

A Complete Line 8 in. to 50 in. Swing
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Horizontal Drills
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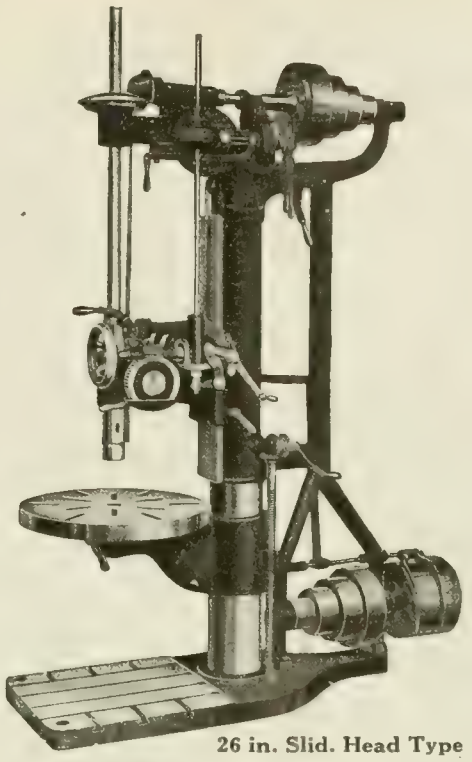

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Two Novel Plans for Harnessing Niagara

By T. KENNARD THOMSON

THE report on a new plan, or rather two new plans, for securing power from Niagara, which is here given, is the work of an engineer of Canadian birth and training.

Mr. T. Kennard Thomson enjoys the honor of being the first Bachelor of Science in engineering to graduate from the University of Toronto. Following his graduation he was with the C. P. R. on construction work, and later went to New York to practise as a consulting engineer.

One of his greatest achievements was the building of the foundations for the Singer Building on Broadway at that time the tallest building in the world. The fact that Mr. Thomson is a practical engineer, with a long and successful record in large undertakings, lends interest to the present scheme. The description of the plans in detail is given below.

Jan. 24, 1921.

To the Honorable Federal
Power Commission,
Washington, D. C.
Gentlemen:

We respectfully beg to submit that the greatest and most uniform and most needed water power resources in the world are in the Niagara River, and that we could obtain the maximum amount of power at the minimum of cost, from any further diversion of water from above the old Falls by our Goat Island plan, and that the best method of developing the maximum amount of power at the minimum of cost in the lower river is by an international dam at Foster's Flats, about 4 miles below the old falls.

While the Goat Island plan will be entirely within the United States, we believe that Canada would readily agree to an international development at that point, as it would obviously save money to the consumers on both sides of the line forever.

Our two projects do not interfere with any of the existing power companies in any way whatever.

Indeed, while we realize that the Governments should control the price for which the power will be sold, we realize the enterprise, the risk and capital which the five pioneer companies put into these original plants, and we therefore think that in fixing such prices, the pioneer companies should be allowed to charge a difference of say $10 a horsepower more than we do, if they so wish.

Neither Mr. Porter nor myself have any financial interest of any kind in any of the present companies.

We realize that no matter what power is sold for, it will always be worth what it cost to develop power by coal.

The cheapest power ever developed by coal in New York City before the war was by the New York Edison and New York Interborough, and it cost them an average of $32.19 a horsepower. That would be equivalent to $70 or $80 a horsepower in the State of New York now, and I was informed in December that it was then costing $90 a horsepower to develop by coal in Toronto.

We can develop two million horsepower at our new dam at Foster's Flats, at a cost of less than $100,000,000 or $50 a horsepower, and can do nearly as well at Goat Island. That means that we could sell for less than $10 a horsepower.

But, as there will never be enough water power to go around, if the manufacturers get our power at $10 or $15 a horsepower, they would have an unfair advantage over their competitors who had to pay $70 or $90 to develop power by coal.

The five pioneer companies developed 650,000 horsepower for $65,000,000 or $100 a horsepower. In doing this they attracted private capital to the extent of $650,000,000 or ten times what they spent themselves.

We claim, therefore, that it will be

Continued on page 60

MISCELLANEOUS

Solder, strictly	$ 0 27½
Solder, guaranteed	0 29½
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	17 00
Red dry lead, 100-lb. kegs, per cwt.	15 00
Gasoline, per gal., bulk	0 42
Pure turp., single bbls., gal.	1 20
Linseed oil, raw, single bbls.	1 00
Linseed oil, boiled, single bbls.	1 03
Wood alcohol, per gal.	2 75
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire size	40 and 5
Can. carbon cutters, plus	10
Standard drills, all sizes	40 and 5
3-fluted drills, plus	10
Jobbers' and letter sizes	40 and 5
Bit stock	50
Ratchet drills	10
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	Net
Bridge reamers, carbon	50
Centre reamers	5
Chucking reamers	Net
Hand reamers	10
High speed drills, list net to plus	20
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At Warehouse]

Rounds and squares	$7.00 base
Hexagons and flats	7.00 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	26	36
Class C	17	26

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 7 50	$ 7 50
Sheets, blue ann., No. 10	6 50	6 50
Canada plates, dull, 52 sheets	13 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz., galvanized	....	.....
Queen's Head, 28 B.W.G.	13 00	.....
Fleur-de-Lis, 28 B.W.G.	12 50	.....
Gorbal's Best, No. 28	....	.....
Colborne Crown, No. 28.	....	.....
Premier, No. 28, U.S.	10 00	10 00
Premier, 10¾-oz.	10 50	10 40
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClennand, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES

Size	Seamless	Lapweld
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.....	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS

Castor oil, per lb.	—
Royalite, per gal., bulk	28
Palacine	31
Machine oil, per gal.	58
Black oil, per gal.	27
Cylinder oil, Capital	1.01
Petroleum fuel oil, bbls., net	11.2

BELTING—No. 1 OAK TANNED

Extra heavy, single and double	15%
Standard	15 and 10%
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 50
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	8¾
Pumice, ground	06
Emery glue	30
Tripoli composition	9½
Crocus composition	12
Emery composition	11
Rouge, silver	64
Rouge, powder, nickel	38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	8½
Grits, 80 and finer	6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	30
Brass sheets, 24 gauge and heavier, base	38
Brass tubing, seamless	42
Copper tubing, seamless	44

WASTE

XXX Extra	.21	Atlas	.19
Peerless	.22	X Empire	.15
Grand	.21½	Ideal	.18
Superior	.21½	X Press	.13½
X L C R	.16½		

Colored

Lion	.13½	Popular	.10½
Standard	.12	Keen	.9
No. 1	.14		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20	Dark colored	.09
Mixed colored	.10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard	10%	Best grades	15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$35 00	$37 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	40 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	43 00	46 00
Copper sheet, planished, 16 oz. base	47 00	50 00
Braziers', in sheets, 6 x 4 base	39 00	42 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 50	$14 50
Sheets, 3½ lbs. sq. ft.	10 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 00	13 50

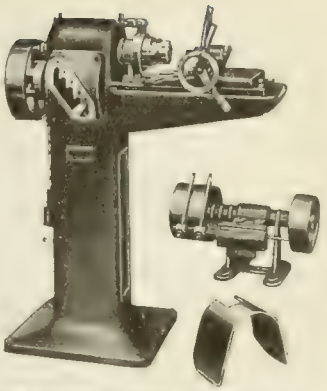
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, hydrochloric	.03¾
Acid, nitric	.10¼
Acid, sulphuric	.03¾
Ammonia, aqua	.20
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.18
Copper, carbonate, annhy.	.35
Copper, sulphate	.10
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	16½
Nickel carbonate	.30
Nickel sulphate	.17½
Potassium sulphide (substitute)	.40
Silver Chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite per 100 lb.	6.50
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated

A SIGN OF INCREASED PRODUCTION



Every Shipment of Geometric Threading Machines Means Increased Production and Decreased Costs in the Shops Where They Are Consigned.

Small threaded parts are correctly duplicated in shortest possible time. These machines thread work which cannot be handled on the ordinary Screw Machine or produced economically in any other manner.

There are three sizes—$\frac{1}{2}$-inch, $\frac{3}{4}$-inch and $1\frac{1}{2}$-inch. The threaded diameters range from $\frac{1}{8}$-inch to $1\frac{1}{2}$-inch inclusive.

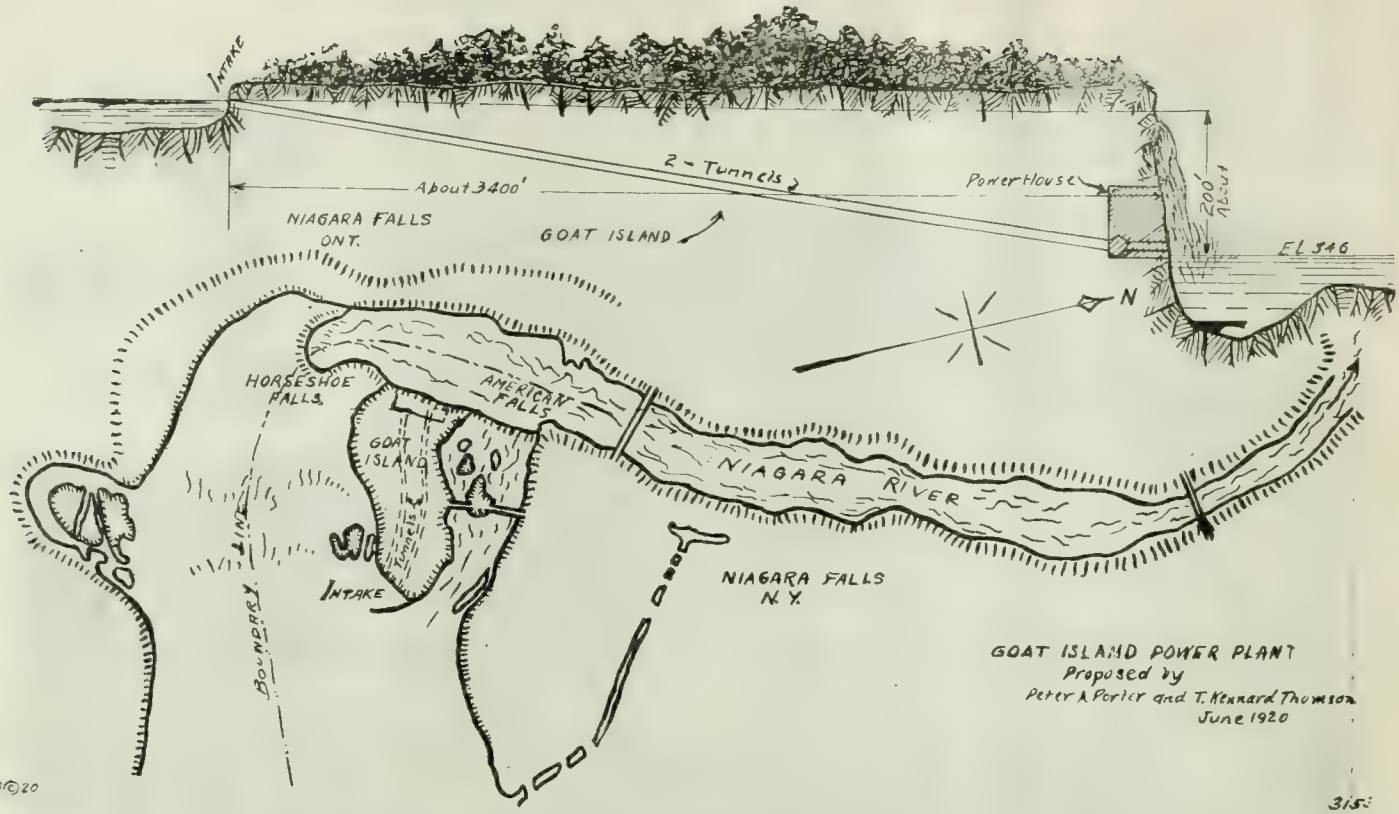
Make Screw Thread Cutting the most satisfactory operation in your plant.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered.



TWO NOVEL PLANS FOR HARNESSING NIAGARA

Continued from page 57

very much better to allow us to develop power and sell it for use within 100 miles from the site, thereby building up the greatest manufacturing district in the world, than to try to distribute it at long distances with scattering results.

When first I started nearly ten years ago to agitate for this dam, people laughed at the idea that there would ever be a demand for 2,000,000 horsepower. In 1917 I wrote to the director of census, Hon. Samuel W. Rogers, asking him how much power was then in use in the State of New York, and what the normal rate of increase was. He sent me a very comprehensive reply, which summed up that we were then using over 3,000,000 horsepower a year in New York State and that the normal rate of increase was 10 per cent. or 300,000 a year. In other words, half of our dam which would go to the States would only supply one-third the amount of power then being used in the State of New York alone, or would only supply the additional demand for the next three years.

On the other hand I might state that Niagara power is now being distributed in Syracuse, 160 miles away, with a loss of less than 10 per cent. using a voltage of 60,000. By increasing this voltage to 110,000 the power is distributed on the Canadian side of the Detroit River about 250 miles. By doubling this voltage again, making it 220,000, the distance of transmission could again be doubled, making it 500 miles, with the same loss. By examining the enclosed diagram showing circles around Niagara Falls of 100, 200, 300, 400, and 500 miles, which area includes part of nineteen states of the Union and two provinces of Canada and contains 60 per cent. of the entire population of the United States and 80 per cent. of the entire population of Canada, it will be seen that all of these would then be within commercial reach of this power, although, as we have shown above, we would only have one-third the amount of power required by one state alone.

It might be stated that New York City alone uses between six and seven hundred thousand horsepower a year.

So the people on the frontier, especially in Canada, now realize that they want all the power that they can get developed.

Many people in Canada now realize that our proposed dam in Foster's Flats must be built sooner or later, and that when it is built, every cent spent on the Chippawa-Queenston Canal and similar diversions on either side of the River will have been so much money wasted, and I have not the slightest doubt that the Canadians will see the advisability of scrapping their canal, which I have been told is costing everywhere from $50,000,000 to $100,000,000 for the reason that no other plan or combination of plans will give within 1,000,000 horsepower as much as our dam will. And if Canada has half of that, it would be equivalent to 5,000,000 tons of coal a year at $10 a ton, making $50,000,000 a year. As soon as Canada is convinced, if she is not already convinced that she can get back the $50,000,000 a year, she will not hesitate to scrap the $100,000,000 plan if necessary.

As a matter of fact, however, it would not be necessary to scrap that or any of the other existing plants until they were worn out, but as our two projects are capable of using all the permissible water, such side issues simply add to the cost to the consumer forever. I have taken the liberty, Gentlemen, of going into such detail in the hope that you will not allow further partial developments on this side of the line, to thus add to the cost forever.

In addition, not only would such diversions greatly add to the cost forever, but, we are quite confident that any further diversion of water from the Rapids would result in an ice jam, which would probably destroy every plant in the River. My reason for this statement is that there is hardly enough water now going over the rocks in the Rapids to carry the ice away. As a proof of this statement; some dozen years ago, an ice jam was formed in the Rapids which only lasted eight hours, and kept the water back until it had done considerable damage to the power plants at the Falls, although such plants were at an elevation full 60 feet above the level of the water where the jam occurred, and when the jam broke, absolutely destroyed everything in the river below, all the way down to Lake Ontario for a height of over 20 or 30 feet above the original water level: wharfs, docks, trees, shrubs, buildings and everything being swept away. This jam was caused by a slight change in the wind at Buffalo, which held back the water for a short time, letting the ice pile up on the rocks in the Rapids.

An engineer making as drastic a statement as this should give more than one example. So I go back probably some

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Quality Service

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Basic Malleable Foundry

STEEL AND IRON BARS

OPEN HEARTH STEEL SHEETS

RAILROAD TRACK MATERIAL
Angle Bars Track Bolts Tie Plates Tie Rods Spikes

SCREWS	WIRE	NAILS
Steel	Steel and Brass, Copper and	Wire
Brass	Bronze, Heavy and Fine,	Cut
Bronze	Bright, Annealed, Coppered,	Boat
Wood and	Galvanized, Tinned, Stranded,	Horseshoe
Machine	Steel and Copper Cable,	Shoe Nails
Screws	Barb, Woven Clothes Line	Tacks

POLE LINE HARDWARE
Pole Steps Cross Arm Braces Guy Clamps Guy Rods

WROUGHT PIPE	FORGINGS	LEAD PRODUCTS
Black Pipe	Car Axles	Lead Pipe
Galvanized Pipe	Shape and Drop Forgings	White Lead
Nipples	Carriage and Automobile	Shot
Couplings	Hardware	Putty

BLOOMS
BILLETS
PLOW BEAMS
ANGLES
CHANNELS

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STEEL COMPANY
OF
CANADA
LIMITED
HAMILTON MONTREAL

WIRE RODS
HORSE SHOES
FENCING
RIVETS
BURRS

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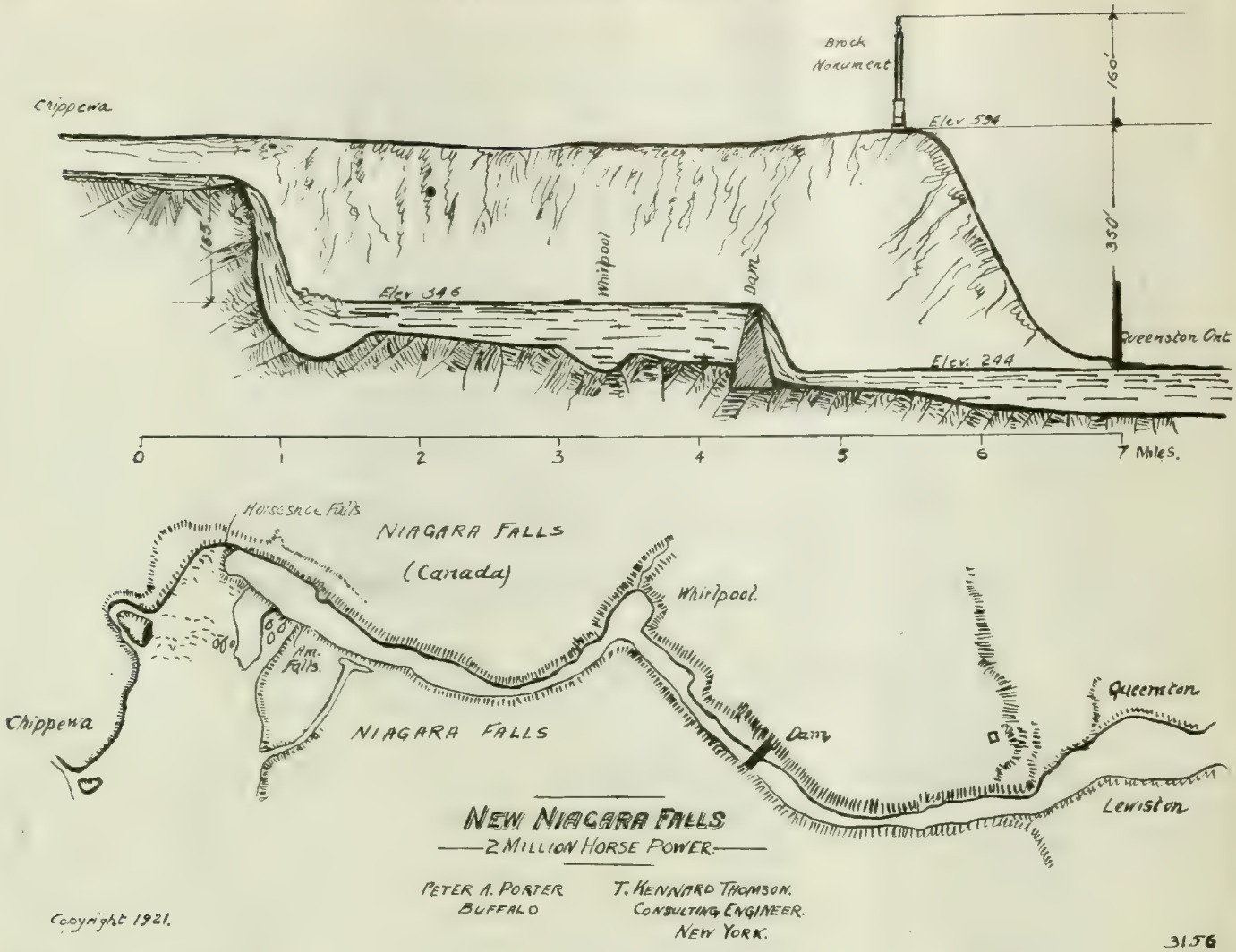


millions of years, when an ice jam probably diverted the Niagara River, causing it to turn a right angle thereby forming the whirlpool, cutting the brand new channel through the bed-rock.

By looking at the plan, it will be seen what an ideal location Foster's Flats is for the dam, for we can build the first part of the dam on dry land, carrying the base of the dam some 30 feet or more below the bed of the river and then divert the entire river through temporary openings at the bottom of the completed section of the dam, making it a comparatively simply matter then to dam the present channel of the river.

As we propose a dam with very flat slopes, about 700 feet base, it will be a very simple matter to handle the ice, as there will be nothing to prevent the ice from going right over the top of the dam, as there will be no sheer drop on the down stream side of the dam to undermine it, the ice simply sliding off on the flat incline. This design has been called a submerged weir. There will be a minimum depth of 135 feet above the dam and minimum flow of about 220,000 cubic feet per second, so there will be no obstruction arising from the ice.

Goat Island Plan

A glance at the plan will show an inclined tunnel of 2500 feet. It does not need any engineering figures to prove that such a tunnel is cheaper than tunnels five or six miles long or the Chippawa-Queenston Canal which is 12 3-4 miles long. Furthermore, we do not lose the valuable head which, in case of the Chippawa-Queenston Canal, amounts to 16 feet. This tunnel can of course be extended far enough above Goat Island to take advantage of the entire head of the river, at and just above, the old falls, and furthermore it does not destroy any property or scenic beauty on Goat Island whatever.

These two projects together could develop about 4,000,000 horsepower a year, every ounce of which could be readily sold and it would be far better to sell it at the site, thereby developing great manufacturing centres and to pay enormous taxes to Canada and the States, so that all would derive equal benefits instead of taxing all for the benefit of a few.

At the same time the matter of canalization, and power, of the St. Lawrence River should also be started. While it is true that the bulk of the power of the St. Lawrence River belongs to Canada, the United States will benefit enormously by the canalization of the St. Lawrence River, as well indirectly from the development of the power.

For the development of 4,000,000 horsepower in the St. Lawrence River, and 4,000,000 horsepower in the Niagara River, or 8,000,000 horsepower together, or to be conservative say 6,000,000, which is equivalent to 6 million tons of coal a year, will mean that there will be ten Pittsburghs on the frontier. Such developments could not fail to benefit every town, village, and city in the United States and Canada. As a matter of fact, the United States will probably benefit by a 30-foot draft from Montreal to the Great Lakes to a much larger extent than Canada, as our country already has free use of the Canadian canals, and I have been informed often make more use of them than the Canadians. The profile will show that there are five lifts in the St. Lawrence River between Montreal and Lake Ontario, and these might possibly be cut down to 3 or 4.

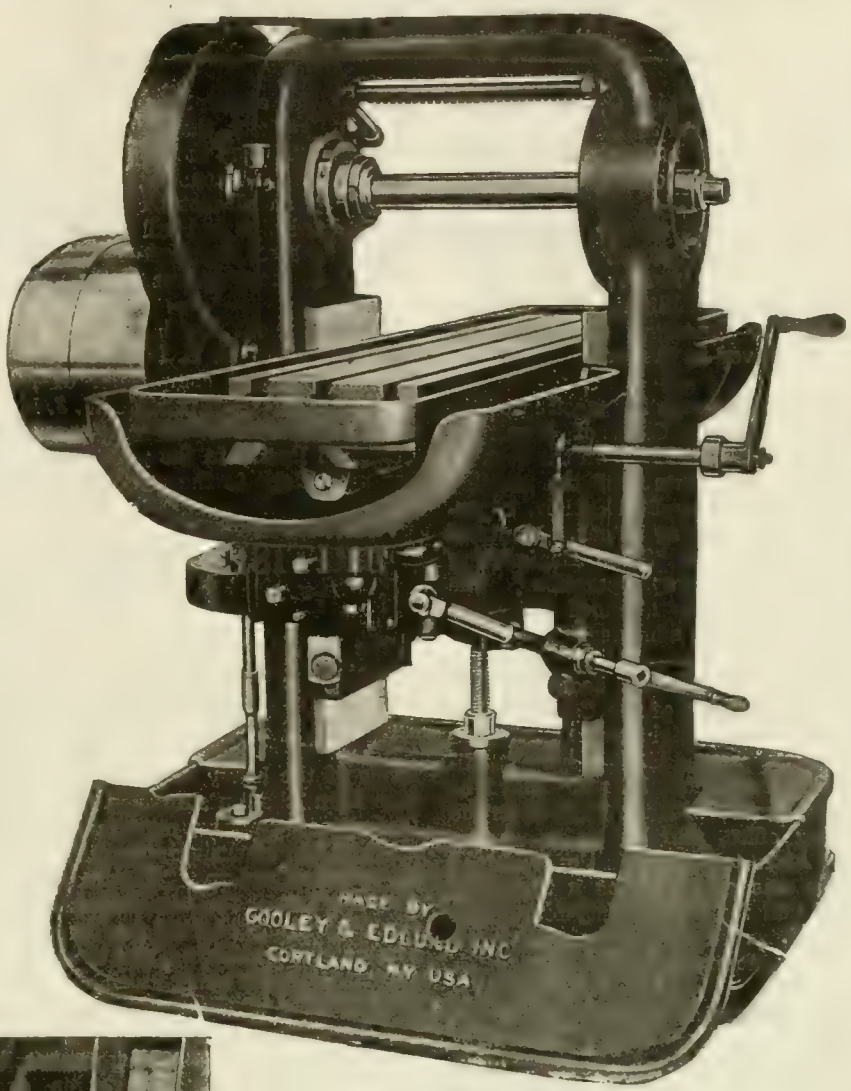
If the United States and Canada will get together and give us the rights to develop this power, we will give a 30-foot draft to the Great Lakes without charge to either government, and we will develop power, under government supervision as to the plans, construction, operation, taxes, selling price of power and our remuneration.

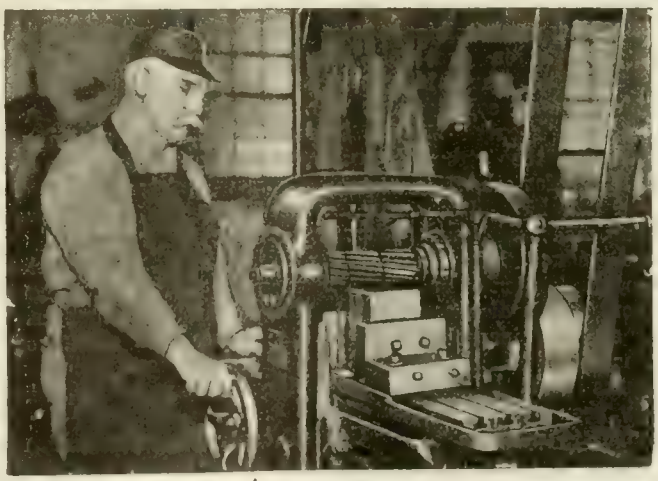
If this work were done by government ownership in the old sense of the word, God help the countries! On the other hand, it will be inconceivable to give a private monopoly worth $600,000,000 or so a year to any individuals. But if the

Continued on page 66

Briggs Millers

For Increased Production and Better Quality





THE Briggs Heavy Duty Miller was designed to handle many rugged jobs that ordinarily tie up the large, expensive millers. By turning out your milling work on a Briggs you get fine quality work, save operating time, and conserve power. Conservation of floor space, too, is a feature of the Briggs —the greatest Production Miller ever developed.

ALL SIZES BRIGGS MILLERS IN TORONTO WAREHOUSE

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MONTREAL and WINNIPEG

GARLOCK WALKER

HIGH GRADE MACHINE TOOLS

The Week's Events in Montreal Industry

The Dominion Bridge Co. are remodelling a snow-plow for the city of Montreal West. The power is obtained by means of a caterpillar tractor.

A. M. Wiseman, of the staff of the British Trade Commissioner for Canada, in Montreal, has been removed to Ste. Anne de Bellevue Military Hospital near Montreal to undergo treatment for wounds received in the war.

At the regular monthly meeting of the Canadian Railway Club, of Montreal, held at the Windsor Hotel on the evening of the 8th, the feature of the meeting was the address by D. E. Blair, superintendent of rolling stock, Montreal Tramways Co., on "Some Engineering Features of Tramway Operation." The meeting was largely attended and many new members were admitted.

H. J. Dalton, who has been assistant auditor of agencies of the Canadian Pacific for the past eight years, has been appointed to succeed E. E. Lloyd as auditor of disbursements. Like Mr. Lloyd, he first saw service with the C. P. R. in the Winnipeg office, starting as a junior clerk. After two years in the Winnipeg office he was appointed as a travelling auditor, and for over twenty-four years was chief travelling auditor with headquarters at Montreal.

A very enjoyable evening was spent last Saturday by the staff members of the Montreal branch of the Canadian Fairbanks Co. and their friends, when a dance was given by the employees of the company. The patrons and patronesses were: C. J. Brittain, vice-president and general sales manager, and Mrs. Brittain; H. B. Walker, controller, and Mrs. Walker; and H. V. Cordell, manager, and Mrs. Cordell.

Escher Wyss & Co. have recently reorganized their Canadian organization. Mr. Th. Seidl, after an absence of several years, again returns to take charge of the Canadian business, and C. H. Withers, who has been looking after the business since 1917, will remain with the firm as assistant manager. The company manufacture large water turbines and hydraulic equipment; they also handle the lines of Messrs. Buhler Bros., of Uzwyl, Switzerland, makers of cement mills, brickworks, automatic elevators, and other specialties.

J. H. Trudell, of Montreal, has recently developed a new automatic train connector, and he has several constructed and installed at the plant of the Montreal General Tool Co. of Montreal for demonstrating purposes. The outstanding feature of the apparatus is the total absence of gaskets, the joints being metal to metal face, and the well-known rubber hose in the old connector has been replaced by an all-metal connection made of standard pipe and ball joints. A company has been organized for the manufacture of these devices.

Announcement has been made of the appointment of E. E. Lloyd to the position of assistant comptroller of the C. P. R. He succeeds the late W. J. Moule. Mr. Lloyd entered the services of the Canadian Pacific in the year 1887, starting as a clerk in the stores department in Winnipeg, and ten years later was appointed chief clerk in the stores department at Vancouver, remaining there until 1903, when he was transferred to the Montreal office of the same department and in the same capacity as chief clerk. In 1904 he was promoted to the office of chief clerk in the auditing of stores and mechanical accounts, and seven years later was elevated to the position of assistant auditor. In 1913 he was appointed auditor in the same department, and in 1918 he was promoted to auditor of disbursements, a position he held until his recent appointment to assistant comptroller.

BRITISH FIRMS ARE GETTING IN SHAPE FOR EXPORT TRADE

The Department of Overseas Trade in Toronto furnishes the following information to Canadian Machinery regarding conditions in Britain:

With the reduction to more normal levels of the heavy home demand which has been the outstanding feature of trade since the war, manufacturers are showing an increasingly marked interest in overseas orders. The response to announcements by the Department of Overseas Trade of calls for tenders has become very gratifying, and the measure of interest now being taken is equally demonstrated by the numbers of visits to the department from representatives of all classes of firms seeking possible openings or general reports on overseas market conditions. The result is that very important foreign and colonial orders have recently been secured by United Kingdom firms, and that strong competition is being put up for others.

Although prices are still high, determined efforts are being made, with considerable success, to reduce them by improved organization, elimination of unnecessary human labor, standardization, massed production, and the increased employment of automatic plant. A noticeable result of these steps is that many firms have now been able to set aside small stocks, and, in addition to offering certain reductions in price, they can make firm quotations and give immediate delivery. This is especially the case in certain branches of machine tools, agricultural machinery, and gas and oil engine trades. Many firms whose order books are too full to permit of collecting stock, have made arrangements whereby certain percentages of their output are available for export.

Locomotive manufacturers, although for the most part still having good orders on their books or under execution, are prepared to consider others, and to begin building, in some cases, immediately. Delivery can generally commence about seven months after receipt of order. As an indication of ruling prices, first-class main line locomotives for passenger traffic range between £15,000 and £17,000, according to specification, and heavy goods locomotives from £11,000 upwards. One or two firms have actually stocks ready for delivery, especially of the industrial type, and a recent advertisement of one of the large firms shows that it could deliver a miscellaneous lot of 130 at once. With the growing improvement of the Scarab oil-burning installation locomotives can easily be converted to use this fuel.

Wagon and carriage builders are quite busy, but practically all are able to look at new orders. Stocks are available in some cases, but for special requirements delivery can be made in anything about two months from receipt of order in the case of wagons, and in five to six months in the case of coaches.

Rails, except in standard sections, are scarcely to be had from manufacturerers in anything under eight months. Some merchants have good stocks of home rails, and recently have quoted for and secured large orders for immediate delivery.

General contractors for road, railway, dock, and other public works schemes have increased their plant and staffs and improved their organizations, and are in a favorable position to put up strong competition where financial guarantees are forthcoming. There are, however, many local schemes in hand, or under consideration, and for the most part it would appear that firms are open to consider only large contracts which would justify the expense and trouble of preparing plans, and sending out plant and staffs, and which would provide work for a considerable period. In order to secure their interest very full particulars,

"MORROW"

DRILLS
REAMERS
FILES
SCREWS
NUTS

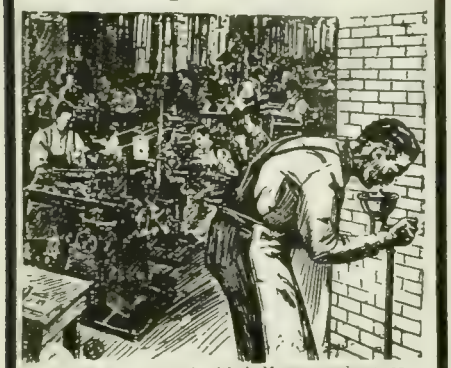
—Prompt Service
—Absolute Reliability

Works at
INGERSOLL

Office and Warehouse
489 St. Paul Street West
Montreal, Que.

If interested tear out this page and place with letters to be answered.

Upon the Health of your employees depend your profit and production



Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO **SANITARY DRINKING FOUNTAIN**

(MADE IN CANADA)

Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

Puro Sanitary Drinking Fountain Co.

Canadian Agents:

McKENZIE BROS.

888F St. Andre St., Montreal, P.Q.

RATES FOR CLASSIFIED ADVERTISING

Rates (payable in advance): Two cents per word. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

including plans, specifications, and terms of payment, should accompany the notification of any such schemes open to tender. Factory plant, especially machine tools, woodworking machinery, tin-making equipment, food treating and preparing plant, including baking and confectionery machinery, printing machinery, etc., is comparatively plentiful, and, for many classes of these orders can be filled fairly promptly. Textile and chemical machinery trades are heavily committed, and, except in some of the smaller lines, considerable time would be required for delivery.

A number of comparatively new British lines are barbed wire and nail making machinery, concrete block making machines, automatic machinery for the manufacture of piano wrest pins, which were formerly made in Germany only, thrust boring plant, wave-power transmission tools, mechanical pickers, magnetic ore separators, etc.

The coal strike has been responsible, it is true, for the temporary partial closing of many concerns, and customers who desire their plant made to order will, no doubt, as a result, have to wait longer for delivery, especially in the case of heavier plant. It is, however, expected that within a short period the effects of the crisis will generally have passed and conditions will have become more normal.

Trade Gossip

A pipe shop is being erected by Crane, Ltd., 83 Terauley St., Toronto.

The United Drug Co., 78 Broadview Ave., are building a $60,000 warehouse.

A $60,000 factory is being erected by the Decalcomania Co. of Canada, Ltd., 364 Richmond St., Toronto.

Tenders will be called shortly for erection of cold storage plant for Devine & Son, 394 Queen Street West.

A new foundry is being erected at a cost of $75,000 on Broad St., Ottawa, by the Beach Foundry Company.

A public garage is being planned by George Buschlen, Parkway Ave., to be erected on Queen St., Toronto.

The plant of the National Steel Car Company, Hamilton, Canada, will be closed for an indefinite period for stock taking.

The National Engineering Company, Limited, of Sarnia, Ont., are adding disc wheels to their list of products in the near future.

A thirty-acre site has been purchased by the Anglo-American Motors, Ltd., at Mimico, Ont., and a factory in ten units will be started shortly.

The first factory of its kind in Western Canada, the Britannia Wire Rope Company, Limited, commenced production at Vancouver recently. It is an all-British concern.

The Huron Specialty Castings Company, Clinton, Ont., will move to Goderich when their plant, which is now being constructed there, is completed.

The Dominion Bridge Co., Lachine, Que., have received the steel contract for extension to factory at a cost of $50,000 for Standard Paint Co. of Canada, Ltd., 52 Victoria Square, Montreal.

It is reported that the executive offices of the International Harvester Co., Ltd., of Canada, are being removed from Chicago, Ill., to Hamilton, Canada, where the Canadian plant has been located for several years.

The Brantford Computing Scale Company, Limited, have acquired the Ker & Goodwin plant in West Brantford, and will move their business there. Additions will be made to take care of the large volume of foreign business offered.

A new industry is to be started at Walkerton shortly, the Sterling Twine Company, Limited, who expect to be in operation some time this month. They will manufacture all kinds of commercial twines of various sizes, grades and qualities.

The Canadian Perfect Wheels, Limited, a recently incorporated company at Listowel, Ont., are remodelling their plant to the requirements of the modern wheel factory. They expect to be manufacturing in April and will produce automobile wheels, disc, wire and wood, and a general line of accessories, stamped work, etc.

TWO NOVEL PLANS FOR HARNESSING NIAGARA

Continued from page 62

governments will give us the rights as above indicated, on the basis that we get so much remuneration if we develop power for say $15 a horsepower, less if it costs more than $15 a horsepower and much more for every dollar saved below $15, we would have all of the incentives of a private ownership without any of the objectionable features.

We therefore beg of you, Gentlemen, that you give us permission to develop the Goat Island plan, and that we also beg of you to arrange for an international agreement, treating the entire question as one unit, thereby saving untold millions to the future generations for they will undoubtedly have to pay not only for our two proposed projects in the future, but also for any and all of the minor diversions such as the Chippawa-Queenston Canal or tunnels on either side of the river.

We therefore respectfully state that we think you have it in your power to create the greatest industrial centres in the world, the results of which would be so far reaching that there is scarcely a country in the world that would not be benefited.

Respectfully submitted,

(Signd.) T. Kennard Thomson.

Personals

H. C. Crow, sales manager, the Canada Metal Company, Limited, Toronto, is making a business trip to the coast. He will be away about a month and will spend some time at the Winnipeg and Vancouver plants.

S. L. Clark, president and manager of Perfect Machine Company, Galt, an aggressive booster, has been chosen as president of Galt Board of Trade. Already plans are being discussed for a progressive year.

J. M. R. Fairbairn, who has just been elected president of the Engineering Institute of Canada, was born in Peterboro in 1873 and has attained a premier position in the engineering world. After a course at the School of Practical Science Mr. Fairbairn went first as an assistant in the Department of the Interior, when he became engineer in charge of construction of the Montreal Park and Island Railway. In 1900 he joined the construction department of the C. P. R. and ten years later was raised to the post of assistant chief engineer, while in 1918 he was appointed chief engineer of the C. P. R. Other officers elected were: Messrs. H. G. Acres and W. J. Francis, as vice-presidents. The following were elected as councillors: F. P. Sherwood and K. B. Thornton, Montreal; S. S. Oliver, Quebec; G. B. Dodge, Ottawa; C. C. Kirby, St. John, N.B.; Prof. C. R. Young, University of Toronto; R. Dobbin, Peterboro; A. C. D. Blanchard, Niagara Falls; H. B. R. Craig, Windsor; W. M. Scott, Winnipeg; H. S. Carpenter, Regina; S. G. Porter, Lethbridge, and H. L. Johnston, Armstrong, B.C.

Catalogues

NEW CIRCULAR

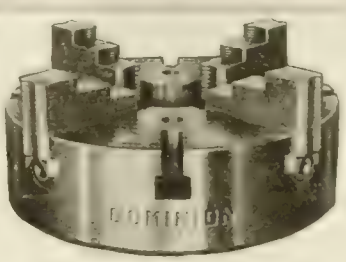
The Oliver Instrument Co., Adrian, Mich., have issued a circular illustrating and describing their sawing, filing, and lapping machine. The literature shows how these machines can be used for sawing and filing articles from carbon, bakelite, cardboard, fibre, soft and hard rubber and leather. This, of course, in addition to its regular metal working uses.

INTERESTING BOOK

The Taylor Instrument Co., Rochester, N.Y., have issued a very attractive January issue of The Tycos-Rochester. This is a little book devoted to things scientific, and, of course, deals more or less with Tyco equipment. It proves interesting reading, however, apart from its trade flavor.

TOOL AND SPECIAL STEELS

The Vulcan Crucible Steel Co., Aliquippa, Pa., have issued a catalogue on tool steels and special steels. This book not only shows the classes and types of steels manufactured, but includes photographs showing the plant, equipment, etc. Some very valuable information to those interested in steels also forms a part of this interesting booklet.



DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY

All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED

Engineers • Manufacturers

BRANTFORD, CANADA

INTERESTING CATALOGUE

The Mason Regulator and Engineering Co., Ltd., Montreal, P.Q., have issued a new catalogue of their products. Every means of condensing the information has been adopted and the data have been made short and concise as possible. In other words it is a condensed catalogue. Should a reader of the book desire further information he is told how to secure it from the larger specialized catalogues published by this firm.

CRANE CATALOGUE

The Herbert Morris Crane and Hoist Co., Ltd., have sent us a copy of their catalogue, No. 76. This book is of the loose-leaf type and contains some valuable data on crane installations. Chain blocks of various types are shown, and illustrations of different uses for the same are scattered throughout the pages. These cover practically all industries and are in themselves a lesson on the use of chain blocks.

Different types of trolleys and I beam runways are next given, these also being well illustrated from actual installations. Hand operated overhead cranes, overhead travelling cranes, travelling gantry cranes, jib cranes, ash hoists, barrel slings, motor driven trolley hoists and motor operated electric cranes are also shown, each style of equipment being illustrated in actual use. This book is actually a handbook on cranes in general.

GRINDER CATALOGUE

The Blanchard Machine Co., Cambridge, Mass., have issued a new catalogue, No. 16, dealing with their high power vertical surface grinder, and this book supersedes all earlier editions. The various types of drives are shown by illustration, and examples of work machined by their grinders is depicted. This is followed by a general description of the machines, together with specifications, etc. Their magnetic chucks are also discussed, together with the continuous reading caliper attachment as used on their machines.

CHUCK CATALOGUE

The Skinner Chuck Co., New Britain, Conn., have issued a new catalogue dealing with their line of chucks. This booklet is called "Chucks and Their Uses" and starts off by telling a story of the origin of chucks. The use and care of modern chucks is then gone into. A list of dont's concludes the contents of this interesting booklet and mechanics in general should read these don'ts as they happen almost every day and are points easily avoided.

NEW CATALOGUE OF LATHE CHUCKS

The Cushman Chuck Company, of Hartford, Connecticut, have prepared a new catalogue for 1921. For several years past their catalogues have been practically re-issues of one that was prepared in 1914, only with the exception that the 1914 list prices were revised in 1917.

There are many pages with useful information for all who have occasion to use lathe chucks, and parts of such are arranged under the following headings: Outfits for lathes; How to increase the efficiency of lathe chucks and prolong their usefulness; how chucks are attached to lathes; dimensions of intermediate flange plates; repairs and replacement parts.

NEW CATALOGUE

The Hanson Clutch and Machinery Co., Tiffin, Ohio, have issued a new general catalogue C 8. This booklet is intended as a handy reference for anyone using or contemplating using friction clutches. The application of their clutches is shown.

Classified Opportunities

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

POSITIONS WANTED

DRAUGHTSMAN (PERTH COUNTY) DESIRES change. Have had general experience of ten years. Am first-class practical shop mechanic, age 30. Married. If you are in need of a young man of ability, who has risen by merit only, let us arrange an interview. Address Box 747, Canadian Machinery. (c6m)

AGENCIES WANTED

SOLE AGENCIES WANTED BY WELL-known, reputable and established English engineering firm, represented all over the world, for Contractors' or Municipalities' small Engineering equipment, which must be first-class, competitive in price, and in constant large demand. British made and patented preferred; if Colonial or Foreign, privilege or manufacturing in England required. Big sales assured for the right Equipment. Write giving details to "Engineering," P.O. Box 1934, Montreal. (c8m)

MACHINERY WANTED

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOOD-working machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (cfm)

WANTED – WOODWORKING MACHINERY and mining machinery, machine tools, boilers and steam pumps, alternating or direct current motors. Contractors' equipment. Apply Box 737F, Canadian Machinery.

PARTIAL LIST

Machine Shop Equipment

At Extremely Low Prices

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long, ⅜ in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1 Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

Standard Equipment & Tool Works

Dept. K. 307 St. James St.
Main 2286 MONTREAL
(20)

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

PATTERNS

Wragge's Pattern Works, 10 George St. South, Galt, Ont., Phone 1105 W. Equipped for best service in wood or metal patterns to any specification. Most reasonable prices. Expert workmanship. "Nothing ragged but the name." (cxxvi3m)

Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

PERFECT MACHINE COMPANY, GALT
Builders of Reliable Machinery.

Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
THE KATIE FOUNDRY, GALT, ONT.

REGO
WELDING
and
CUTTING
APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

Carter Welding Co.
of Toronto, Limited
7-11 Sheppard St., Toronto, Ont.
Phones: Adelaide 2841 and 1524
(TF)

FOR SALE

2—ROTARY STEAM DRIERS—6′ DIAM. x 25′ long; complete.
2—ENDLESS DOUBLE LEATHER BELTS, 13″ x 50′ total length each.
1—8″ x 12″ DOUBLE DRUM BEATTY HOIST and boiler.
1—6″ x 12″ DOUBLE DRUM BEATTY HOIST and boiler.
2—AIR COMPRESSORS, 800 FT. CAPACITY: belted.
Box 752F, Canadian Machinery.

ELECTRIC MOTORS FOR PROMPT SHIPment, new and re-manufactured, fully guaranteed. 3 Phase, 25 Cycle.

No.	H.P.	Volt.	R.P.M.	No.	H.P.	Volt.	R.P.M.
1	½	550	1,400	1	15	550	1,400
1	1	550	1,400	1	20	550	1,400
1	1¾	220	1,400	3	25	550	750
5	2	550	1,400	3	30	550	720
1	3	550	1,400	3	40	550	720
6	5	220	720	4	50	550	720
1	4	550	1,400	3	75	550	720
3	7½	550	1,400	1	150	550	720
10	10	550	1,400	1	200	550	720

Box 750F, Canadian Machinery.

FOR SALE

Perfected rotary engine valve, simple design, free from defects common in rotary valves. Patented Feb. 20, 1917. Can be inspected at and purchased from H. W. Petrie Limited, Toronto.

FOR SALE

Enclosed liquid fuel combustion apparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented April 3, 1917. Can be inspected at and for sale by H. W. Petrie, Limited, Toronto.

MACHINERY FOR SALE

1—24″ x 12′ Canadian Machinery Lathe
2—22′ x 10′ Davies Lathes.
1—21″ x 10′ London Lathe.
6—20″ x 8′ C.M.C. Lathes.
1—18″ x 8′ Mueller Lathe.
3—19″ x 8′ C.M.C. Lathes.
1—18″ x 8′ London Lathe.
1—16″ x 8′ C.M.C. Lathe.
1—16″ x 6′ McDougall Lathe.
1—D-1 H. D. Colburn Drill.
2—No. 24 H. D. Foote-Burt Drills.
1—28″ B. G. Barnes Drill.
1—22″ B. G. Barnes Drill.
1—D.C. Compound Wound Generator, 110 Valts, 125 Amp.
2—No. 54 Perkins Sprue Cutters.
2—2″ x 26″ Pratt & Whitney Turrets.
1—10″ x 52″ Plain Landis Grinder.

Write us for particulars and prices.

Box 751 F.

Canadian Machinery

Classified Opportunities

MACGOVERN & COMPANY INCORPORATED POWER MACHINERY

Motor Generator Sets

A.C., 2 and 3 phase, 60 cycle, D.C., 250 Volts

D.C. Generator				A.C. Motor
K.W.	Make	R.P.M.	H.P.	Make.
17½	General Electric	1800		General Electric
25	General Electric	870	35	Western Electric
35	Northern	1200	50	Western Electric
50	Allis-Chalmers	1150	75	Allis-Chalmers
50	Westinghouse	1120	75	Westinghouse
75	Crocker-Wheeler	900	125	General Electric
100	Sprague	900	150	Western Electric
150	General Electric	900	225	General Electric
200	Westinghouse	870	290	Westinghouse
200	Westinghouse	575	300	Westinghouse
300	Crocker-Wheeler	1200	500	General Electric
400	Thomson-Ryan	360	600	Crocker-Wheeler

Write for further particulars and details of 125 volt and 550 volt Motor Generators.

MacGOVERN & COMPANY, INC.

285 BEAVER HALL HILL, MONTREAL

Offices: New York, Pittsburgh, Seattle. Plants: Linden, N.J.
Buyers and Sellers of New and Used Machinery

Ideal Offerings of Used Machines

LATHES

3—28″ x 12′ Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
3—26″ x 12′ C.M.C., 3 step cone, D.B.G., Q.C.G.
2—26″ x 10′ C.M.C., 3 step cone, D.B.G., Q.C.G.
6—24″ x 12′ Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
1—24″ x 12′ Rahn Larmon, 3 step cone, S.B.G., Q.C.G.
3—24″ x 10′ Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
1—22″ x 10′ Devenport, 3 step cone, D.B.G., Q.C.G.
1—18″ x 8′ Greaves Klausman, 3 step cone, D.B.G., Q.C.G.
1—18″ x 8′ Walcott, 3 step cone, D.B.G., Q.C.G.
1—14″ x 6′ American, 3 step cone, S.B.G., Q.C.G.

ADDRESSOGRAPH

1—Type A. Rubber System, complete, motor driven.

Our complete list includes other lathes, screw machines, turret lathes, horizontal boring mills, upright and radial drills, presses, pumps, boilers, etc. Write for particulars.

A complete line of Elliot Woodworking Machines, Belleville and Wagner Motors.

Western representative for Geo. F. Foss Machinery & Supply Co., Ltd. Montreal, Que.

R. S. HOLLY

Room 37, 33 Richmond Street West
Toronto, Ont.
Telephone: Main 4728

Would You Like to make some Extra Money?

Of course you would. Well then, why not do so? Canadian Machinery is always on the lookout for well-worth-while ideas, and are willing to pay a good price for them.

We are often asked, "What sort of ideas do you want?" Briefly, what we are desirous of obtaining is this, "Any idea that has proved of value in the machine shop, drafting room, or tool room." Think of how you got over some difficulty, a ticklish piece to hold in the lathe, or perhaps how you increased production on some particular piece. Any idea that saves time or money in the machine industry will appeal to us. Never mind the style. Write it as best you know how. We will put the finishing touches to both the wording and the sketch. Start in **NOW** and send us something of such a nature.

Address it to

The Editor, Canadian Machinery

143 University Ave., Toronto, Can.

Of Interest to Every Canadian

Number One of a Series of Advertisements

Efficient service is the keynote of membership of

Canadian Machinery

—IN—

Canadian National Newspapers and Periodicals Association

—a highly constructive service—absolutely dependable and devoid of prejudice and personal bias. It means much to you!

The policies and principles back of this important service enable you to secure practical and impartial information of great value in business and in the home: and they assure a ready fund of literature of exceptionally high standard at all times.

To read the Association's Standards of Practice listed herewith is to understand what this Association means to you.

Standards of Practice

Canadian National Newspapers and Periodicals Association

THE Members of this Association shall dedicate their best efforts to the cause of business, and public service, and to this end shall pledge themselves:

1. To consider first the interests of the Subscriber.
2. To work for truth and honesty in all departments.
3. To eliminate, in so far as possible, their personal opinions from their news columns, but be leaders in thought in their editorial columns, and make their criticisms constructive.
4. To refuse to publish puffs, free reading notices, or paid write-ups, to keep their reading columns independent of advertising considerations, and to measure all news by the standard "Is it real news?"
5. To decline any advertisement which has a tendency to mislead, or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation, including detailed circulation statements, subject to proper authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function in the field which they serve, and then to strive, in every legitimate way, to promote that function.

This is Number One of a series of advertisements regarding an Association that typifies thorough-going Canadian stability. Read the forthcoming advertisements in the Magazines, and Agricultural, Business, Religious and Educational newspapers, and Technical newspapers.

Canadian National Newspapers and Periodicals Association

Office - 70 Lombard Street - Toronto, Ontario

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"The most useful information contained in any paper I get"—so a Western banker writes in to-day's mail, renewing his subscription for FINANCIAL POST.

"Very often," his letter goes on to say, "I am called on to suggest investments for small amounts, sometimes as low as a few hundreds, and I find your Investors' Inquiry Service a reliable partner to consult. If every investor knew there was such a service at his call it would surely lessen the losses of many of these people."

The Investors' Inquiry Service fills just that need. Unless you are perfectly sure of your investments, write us before you buy.

It costs FINANCIAL POST subscribers nothing to be sure before placing hard-earned savings in stocks that may never have a chance of paying dividends.

Trained service men will give you the benefit of keen analysis based on the facts behind the securities you are considering. This is one of many features enjoyed by our readers.

THE FINANCIAL POST

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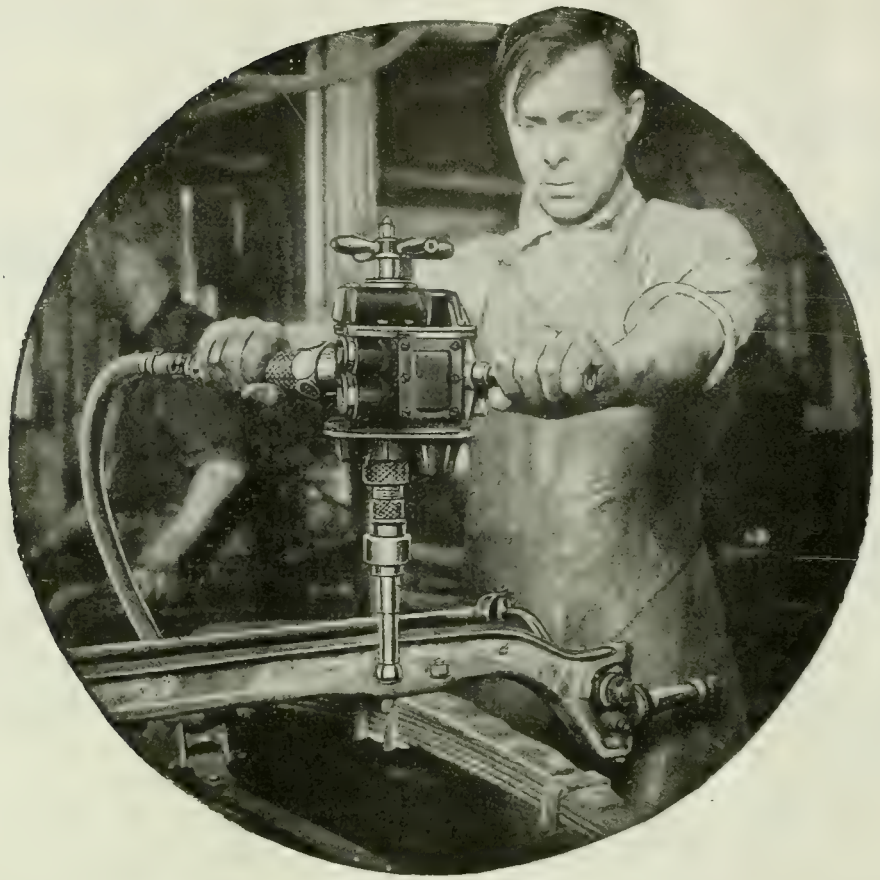
Send me for one year (52 issues) The Financial Post.
I attached $5.00. Commence at once.



Piece workers prefer Little Giants

BECAUSE "they can push them harder and earn more."

Piece workers demand the speediest drill manufactured; the foreman of the assembly shop requires both maximum output and quality work.

Good reasons why Little Giant Air Drills are now standard in hundreds of shops and plants.

Another reason—the toggles of Little Giants are equipped with quickly *renewable* bearings. No need to scrap an entire toggle because of a minor worn part.

Little Giants are ready to stand comparative test in *your* plant and become *your* standard drill. Prompt delivery can be secured from the Company Branches listed below.

Sales Representatives

The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 8t Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

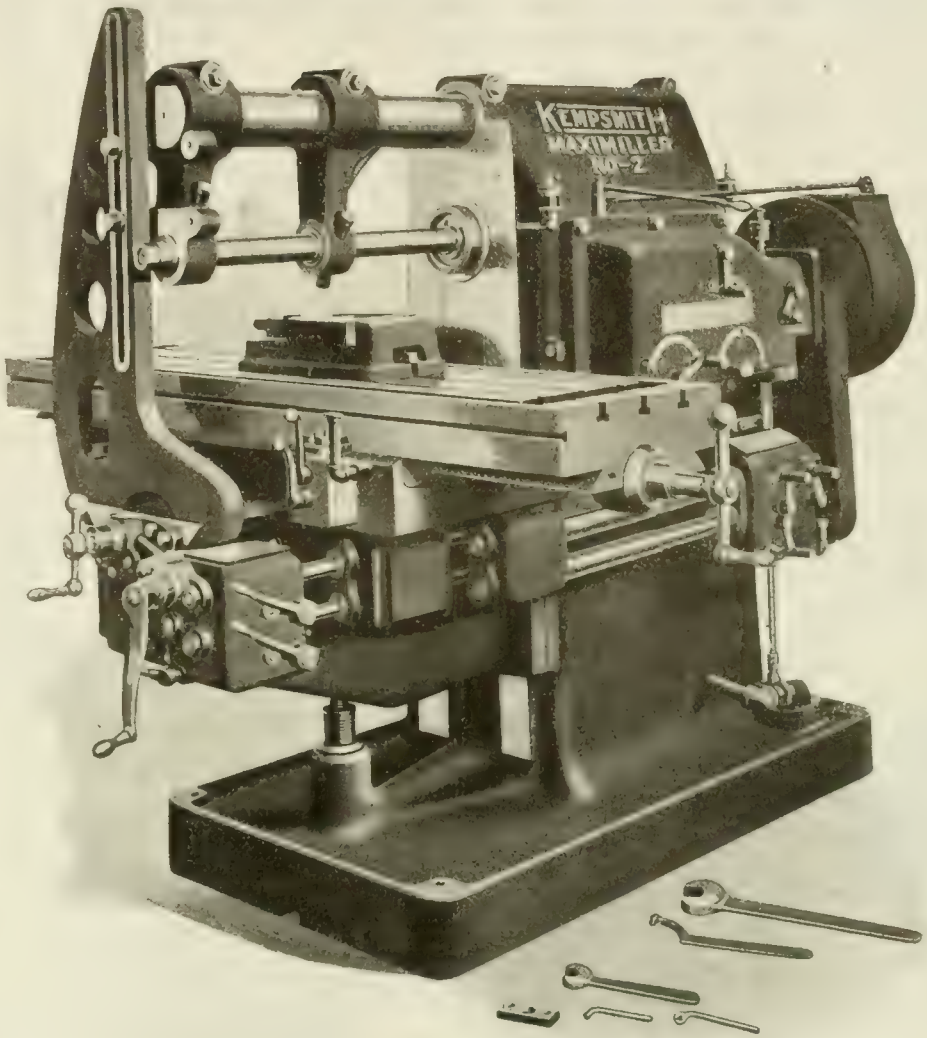
P-51-H

BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · VACUUM PUMPS · PNEUMATIC HOISTS,
GIANT OIL AND GAS ENGINES ROCK DRILLS · COAL DRILLS

GIANT ENGINES

Dependable Power at *Less Cost Per Hour*

KEMPSMITH



No. 2 PLAIN MAXIMILLER

Kempsmith Millers are built in three sizes each in the Plain and Universal Cone Types, two sizes of Maximiller Geared Head Types, a Production Type, with a choice of three table ranges, and two sizes of Vertical Geared Head Type. Our Knee Type Millers can be fitted with a complete line of attachments, which greatly increase the range of the milling machine.

Literature will be gladly sent upon request.

THE KEMPSMITH MANUFACTURING CO.

MILWAUKEE, WIS., U.S.A.

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CANADIAN DEALERS:—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Canada

If interested tear out this page and place with letters to be answered.

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STEEL CASTINGS

ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.

PROMPT DELIVERY

Manitoba Steel Foundries, Ltd.

1204 McArthur Building

Winnipeg - - - Manitoba

Eclipse INTERCHANGEABLE

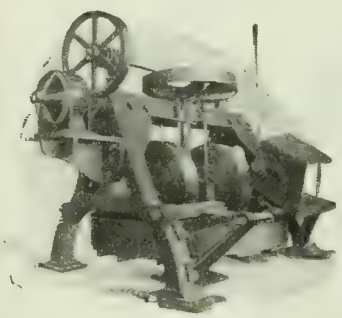
Standard Tools

Interchangeable Counterbores, Core Drills, Connecting Rod Cutters, Countersinks, Inverted Counterbores, Spot Facers, Adjustable Length Holders.

Eclipse Counterbore Co., Ltd.

Walkerville, Ontario

Canadian Steel Foundries Need Frost Improved Sand Mills



WINNING FEATURES

Heavy Mullers
Unloading Device
Motor or Belt Drive

The Frost Mfg. Co.

112 W. Adams St., Chicago

FOR SERVICE ON

Jigs, Fixtures, Gauges

SPECIAL MACHINE TOOLS

SPECIAL MACHINERY

General Machine Work and Repairs

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The Crescent Machine Co.

LIMITED

20 Longueuil Lane Montreal, Que.

The Hughes Owens Co. Ltd.

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Manufacturers

Blue and Black Print Papers

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CRANE

LIMITED

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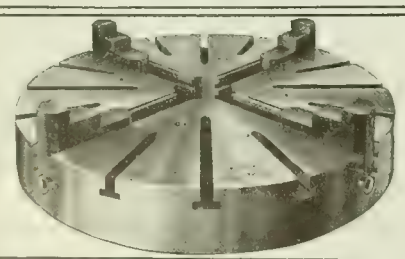
1280 ST. PATRICK ST

MONTREAL

BRANCHES: Toronto, Winnipeg, Vancouver.
SALES OFFICES: Halifax, Quebec, Ottawa, Calgary



ALL STEEL INDEPENDENT CHUCKS

Designed to give strength and durability with high-speed cutting tools. Accurate and dependable always.

We make a complete line of steel chucks, including Geared Scroll Chucks and the Geared Scroll Combination.

UNION MANUFACTURING COMPANY

New Britain, Conn. New York Office: 26 Cortlandt Street

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

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INDUSTRIAL DIAMONDS
Goods Submitted on Memorandum if Desired
JOHN W. GORDON, Manager
5 James Street, ST. CATHARINES, ONTARIO

WHEEL TRUEING TOOL CO.
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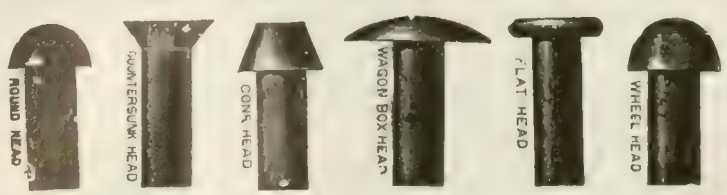

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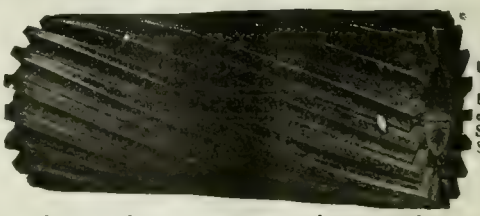

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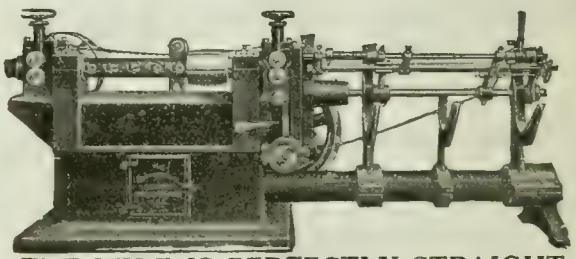

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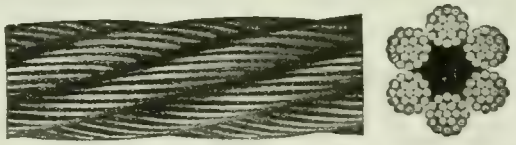

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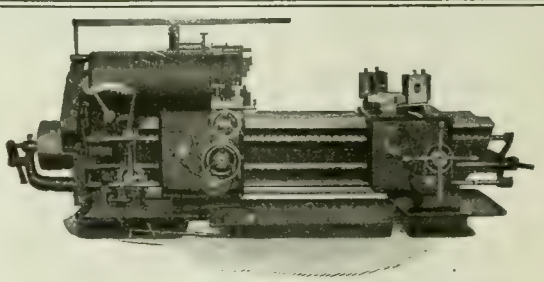

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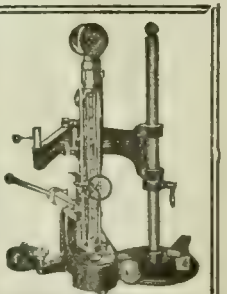

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Bucket Carriers, Pivoted
Can. Link-Belt Co., Toronto, Ont.

Buffing or Polishing Machines (See Polishing and Buffing Machines)
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

Bulldozers
Bertram & Son, Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

Burners, Oil and Gas
Can. Hauck Burner Co., Port Hope, Ont.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

Bushings
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Calipers
Brown & Sharpe Mfg. Co., Providence, R.I.
Goodell & Pratt Co., Greenfield, Mass.
Starrett Co., L. S., Athol, Mass.

Cams
Canada Foundries & Forgings Co., Welland, Ont.

Can-Making Machinery (See Sheet Metal Working Machinery
Rice Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

Cars, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Castings, Aluminum
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

BUYERS' DIRECTORY

Castings, Brass and Bronze
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
International Machinery & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Copper
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Marine
Can. Steel Foundries, Montreal, Que.

Castings, Die Molded
Electric Steel & Engineering Co., Welland, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Ferro-Alloy
Can. Steel Foundries, Montreal, Que.

Castings, Iron
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont
Canada Electric Castings Co., Ltd., Orillia.
Electric Steel & Engineering Co., Welland, Ont.
Fleck Ltd., Alexander, Ottawa, Ont.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Hyd. Press
Can. Steel Foundries, Montreal, Que.

Castings, Monel Metal
Can Driver-Harris Co., Ltd., Walkerville, Ont.

Castings, Naval Bronze
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Nichrome
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Nickel
Can. Hanson & Van Winkle Co., Toronto, Ont.

Castings, Semi-Steel
Davidson Mfg. Co., Thos., Montreal, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

Castings, Steel
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

Cements, Iron
Smooth Mfg Co., Jersey City, N J

Centering Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

Chains (See Sprockets and Chains)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

Chains, Driving
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg Co., Lisbon, Ohio

Chasers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chemists
Toronto Testing Laboratory, Toronto, Ont.

Chucking Machines
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio

Chucks, Drill
Jacobs Mfg. Co., Hartford, Conn.

Chucks, Drill and Tap
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Lathe
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg Co., New Britain, Conn
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Magnetic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chucks, Planer
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Chucks, Vertical Boring Mill
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Clamps, Machinists'
Columbia Hdwe. Division, Cleveland, O
Dickow, Fred C., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

Cleaners, Metal, Waste, General
Oakley Chemical Co., New York, N Y

Clocks, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Clutches, Friction
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

Coal and Ash Handling Machinery
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Coal-Storage Systems
Can. Link-Belt Co., Toronto, Ont

Collars, Shaft or Set
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

Collets
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie Ltd., H W, Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Compounds, Carburizing, Case Hardening and Tempering
Cataract Refining Co., Toronto, Ont.

Compounds, Cleaning
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont
Oakley Chemical Co., New York, N Y.

Compounds, Cutting, Drilling, Grinding, Screw Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N Y

Compressors, Air
Curtis Pneumatic Machinery Co., St. Louis, Mo.

Compressors, Air and Gas
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie Ltd., H W, Toronto, Ont

Cones, Friction
Norton Co. of Can., Ltd., Hamilton, Ont.

Connecting Rods and Straps
Canada Foundries & Forgings Co., Welland, Ont.

Contract Work
Ford-Smith Machine Co., Hamilton, Ont
Victoria Foundry Co., Ltd., Ottawa, Ont.

Conveyors and Elevators (See Elevators)
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

Copper
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Cored Bronze Bars
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Cotter Pins
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Counterbores
Cleveland Twist Drill Co., Cleveland, O
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Counters, Revolution
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass

Countershafts
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

Countersinks
Butterfield & Co., Inc. Rock Island, Que
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Couplers, Car and Locomotive
Can. Steel Foundries, Montreal, Que

Couplings, Flexible
Holden Co., Ltd., Montreal, Que

Couplings, Rigid
Bernard Industrial Co., A., Fortierville, Que.

Couplings, Shaft
Bilton Machine Co., Bridgeport, Conn
Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont

Cranes, Hand (See Hoists, Hand)
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

Cranes, Locomotive
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Cranes, Traveling
Bertram & Son Co., Ltd., The John Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont
Northern Crane Works, Walkerville, Ont

Crank Pin Turning Machines
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa

Cutters, Flue
Holden Co., Ltd., Montreal, Que.

Cutters, Gear
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Brown & Sharpe Mfg. Co., Providence, R I.
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, High Speed
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Madison Mfg Co, Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Milling
Armstrong Whitworth of Canada Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg Co., Providence, R I.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Elliott & Whitehall Tool Co., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co. Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Cutters, Stay Bolt
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Cutters, Thread
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

Cutting-Off Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie Ltd., H W, Toronto, Ont
Starrett Co., L S, Athol, Mass.

Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Cutting-Off Tools
Armstrong-Whitworth Canada, Ltd., Montreal, Canada
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

Cutting Oil Filters (See Oil Filtering Systems)
Bowser, S. F., & Co. Ltd Toronto Can
Cataract Refining Co., Toronto, Ont.

Cutting, Oxy-Acetylene
Carter Welding Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Cutting, Oxy-Hydrogen
National Electro Products Ltd., Toronto, Ont

Dealers, Machinery (See Searchlight Section)
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont

Deckle Straps
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Diamonds, Black and Rough
Joyce-Koebel Co., Inc., New York, N Y

Diamond, Carbon and Bortz
Joyce-Koebel Co., Inc., New York, N Y

Diamond Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Can Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

Diamond Crossings
Can. Steel Foundries, Montreal, Que

Die-Castings
Tallman Brass & Metal Ltd., Hamilton, Ont

Dies, Pipe-Threading
Jones & Lamson Machine Co., Springfield, Vt

Die Sinking Machines, Automatic
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

Die Sinkers
Kimber & Hillier, St. Catharines, Ont.

Dies, Screw and Thread Cutting
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc. Rock Island Que
Greenfield Tap & Die Corp., Galt Ont
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland Ohio

Dies, Sheet-Metal and Sub-Press (See Tool Work)
Armstrong-Whitworth of Canada Ltd., Montreal, Canada
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont
Ford-Smith Machine Co. Hamilton, Ont
Toledo Machine & Tool Co., Toledo, Ohio.

Dies, Forging
Armstrong-Whitworth Canada Ltd., Montreal, Canada
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg Co., St Catharines, Ont.

BUYERS' DIRECTORY

Dies, Hammer
Kimber & Hillier, St Catharines Ont

Dies, Self-Opening, Adjustable
Geometric Tool Co, New Haven, Conn
Herbert Ltd, Alfred Toronto Ont
Jones & Lamson Machine Co, Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co, Detroit, Mich.
National Acme Co, Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co, Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co, New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co, Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Disc Cement
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co Chicago, Ill

Dividing Heads
Ackworthie, Ltd, John, Birmingham, Eng
Dickow, Fred C, Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co Milwaukee Wis
Petrie, Ltd, H W, Toronto Ont

Dogs, Lathe and Milling Machine
Armstrong Bros Tool Co Chicago, Ill

Drafting Boards and Tables
Darling Bros Ltd, Montreal Que
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co, Ltd, Montreal, Que

Drafting Materials
American Lead Pencil Co, New York City, N.Y.
Darling Bros, Ltd., Montreal, Que
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co, Ltd, Montreal, Que

Dressers, Grinding Wheel
Carborundum Co, Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy Co, Grand Rapids Mich

Drill Holders
Armstrong Bros Tool Co, Chicago, Ill

Drill Rods
Armstrong-Whitworth, of Canada, Ltd Montreal, Canada
Aikenhead Hardware Ltd, Toronto, Ont
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drill Speeders
Canada Machinery Corp., Galt, Ont.

Drilling Machine Heads
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co, Cincinnati, Ohio.

Drilling Machines, Automatic
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Bench
Beacon Engineering Co, Tipton, England
Can. Blower & Forge Co., Ltd., Kitchener.
Goodell & Pratt Co., Greenfield, Mass.
Henry & Wright Mfg Co, Hartford, Conn
High Speed Hammer Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U S Electrical Tool Co Cincinnati, O
Wisconsin Electric Co, Racine, Wis

Drilling Machines, Electric and Hand
Aikenhead Hardware Ltd, Toronto, Ont
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co, Geo F., Montreal, Que.
Garlock Walker Mchy Co Toronto Ont
High Speed Hammer Co, Rochester N Y
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A B Hespeler Ont
Wisconsin Electric Co Racine Wis

Drilling Machines, Gang
Bertram & Son Co, Ltd, The John Dundas Ont
Bilton Machine Co., Bridgeport, Conn.
Garlock Walker Mchy Co Toronto Ont
Hoefer Mfg Co, Freeport Ill
Pratt & Whitney Co, of Canada, Ltd, Dundas, Ont.

Drilling Machines, Heavy Duty
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertram & Son Co, Ltd, The John Dundas, Ont.
Canada Machinery Corp, Galt Ont
Garlock-Walker Mchy Co Toronto Ont
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co, Rockford Ill.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)
Canada Machinery Corp., Galt, Ont
Gisholt Machine Co, Madison, Wis
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co, Rockford Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Multiple Spindle
Beacon Engineering Co., Tipton, England
Bertram & Son Co, Ltd, The John Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

Drilling Machines, Pneumatic
Can Ingersoll Rand Co, Ltd, Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Chicago Ill.

Drilling Machines, Portable
Haskins Co., R. G., Chicago Ill
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Radial
Bertram & Son Co, Ltd, The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont
Williams Machinery & Supply Co, A. R., Montreal, Que.

Drilling Machines, Sensitive
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingnam, Eng.
United States Machine Tool Co., Cincinnati, Ohio
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Turret
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co, A R, Toronto, Ont.

Drilling Machines, Vertical
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co, Ltd, The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng
Streiffinger Co of Can, Ltd., Chas A Windsor, Ont.

Drills, Center
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drills, High Speed Twist
Armstrong Whitworth Co. of Can, Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont
Foss Machinery & Supply Co Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co Ltd., John Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que
Sheffield Twist Drill & Steel Co Sheffield, Eng.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co. of Canada, Ltd Walkerville, Ont.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass

Drills, Twist and Flat
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd. Walkerville, Ont.

Dust Handling Equipment
Can. Blower & Forge Co., Ltd., Kitchener.
Sturtevant Co., B. F., Boston, Mass.

Electrical Instruments
Bristol Co Waterbury, Conn
Northern Electric Co., Montreal, Que.

Electrical Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que
U S Electrical Tool Co, Cincinnati O

Elevating Trucks (See Trucks)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Elevators and Conveyors
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

Emery Cloth
Wausau Abrasives Co, Chicago, Ill.

Emery Wheels (See Grinding Wheels)
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

Engines, Capstan
Kennedy & Sons, Wm., Owen Sound, Ont.

Engineers, Mechanical
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

Expanders, Tube
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Eyeglasses, Safety (See Goggles, Safety)
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc, Reading, Pa.

Fans, Electric
Can. Blower & Forge Co., Ltd., Kitchener
Northern Electric Co., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass

Fans, Exhaust
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie Ltd, H W, Toronto Ont
Sturtevant Co, B F, Boston, Mass

Fans, Ventilating
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Fibre
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co Montreal Que

File Handles
Ingersoll File Co., Ltd., Ingersoll, Ont.

Files and Rasps
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co Geo F Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co Montreal, Que.
Morrow Screw & Nut Co Ltd., John Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont
Simonds Canada Saw Co., Montreal, Que

Filing Machines
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Filler, Iron (See Cements, Iron)
Smooth Mfg. Co., Jersey City, N.J.

Fire Extinguishers
Can Consolidated Rubber Co, Ltd, Montreal, Que.

Fittings, Pipe
International Malleable Iron Co., Guelph, Ont

Flexible Shafts
Aikenhead Hardware Ltd., Toronto, Ont.
Haskins Co., R. G., Chicago, Ill

Flux, Galvanizing
British Smelting & Refining Co., Ltd., Montreal, Que.

Fluxes, Welding
L'Air Liquide Society, Toronto, Ont.

Forging Machinery
Acme Machinery Co, Cleveland Ohio
Bertram & Son Co, Ltd The John, Dundas Ont
Brown, Boggs & Co Ltd, Hamilton, Ont
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy Co, Toronto Ont
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

Forgings, Drop
Canada Foundries & Forgings Co, Welland Ont
Dominion Bridge Co Ltd, Lachine Que
Dominion Forgings & Steel, Hamilton Ont
Hepburn Ltd, John T, Toronto, Ont
N S Steel Co, Ltd New Glasgow, N S
Steel Co of Can Ltd Hamilton Ont

Forgings, Hammer
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd Toronto, Ont
Dominion Bridge Co Ltd Lachine Que
Dominion Forgings & Steel Hamilton Ont
Hepburn Ltd John T Toronto, Ont
N S Steel Co, Ltd New Glasgow, N S
Steel Co of Can Ltd Hamilton Ont

Foundry Equipment
Can Ingersoll Rand Co, Ltd, Sherbrooke, Que
Can Ingersoll Rand Co, Ltd Sherbrooke, Que
Ford Smith Machine Co Hamilton Ont
Holden Co, Ltd, Montreal, Que
McDougall Co., Ltd, R, Galt Ont
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Foundry Supplies
Atkins & Co, Inc, E C, Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co, B F, Boston, Mass

Frogs, Spring or Rigid
Can. Steel Foundries, Montreal, Que

Fuel Oil Burning System
General Combustion Co of Can, Ltd, Montreal Que

Furnaces, Electric
Electric Furnace Construction Co, Philadelphia Pa
General Combustion Co of Can, Ltd, Montreal, Que.

Furnaces, Heat Treating Coal
General Combustion Co of Can, Ltd, Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que
Rockwell Co, W S, New York City

Furnaces, Heat Treating Oil and Gas
Armstrong Whitworth of Canada Ltd, Montreal Canada
Bellevue Industrial Furnace Co, Detroit
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
General Combustion Co of Can, Ltd, Montreal Que
Mechanical Engineering Co Three Rivers, Que
Rockwell Co W S New York City
Walker & Sons Metal Products, Ltd, Hiram, Walkerville, Ont

Furnaces and Ovens, Electric
Electric Furnace Construction Co Philadelphia Pa
Petrie Ltd H W Toronto Ont
Volta Mfg Co Welland, Ont
Walker & Sons Metal Products Ltd Hiram, Walkerville, Ont.

Furnaces, Tempering and Annealing
Bliss & Sterling Mfg Co Providence R I
Electric Furnace Construction Co., Philadelphia Pa
Mechanical Engineering Co Three Rivers Que
Rockwell Co W S New York City
Walker & Sons Metal Products Ltd, Hiram, Walkerville, Ont.

Furniture, Machine Shop
Canada Wire Mfg Co Toronto Ont
Montreal Machinery Importers Ltd Montreal
Nicholson File Co Port Hope Ont
Stewart & Co Duncan Glasgow Scot

Gages, Comparator
Brown & Sharpe Mfg Co Providence R I
Goodell & Pratt Co Greenfield, Vt
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Gage Co Ltd E W Windsor Ont
Pratt & Whitney Co Hartford Conn
Scott & Co Ltd J G Montreal Que
Starrett Co, L S Athol, Mass

Gages, Measuring (See Tool Work)
Brown & Sharpe Mfg Co Providence R I
Canada Machine Tool Co Ltd Montreal Que
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Gage Co Ltd E W Windsor Ont
Starrett Co, L S Athol, Mass

Gages, Recording
Bristol Co Waterbury Conn
Johansson Gage Co Ltd E W Windsor Ont

BUYERS' DIRECTORY

Gages, Snap, Thread and Cylindrical
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Special Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Standard
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Elliott & Whitehall Tool Co., Galt, O
Johansson Inc., C. E., Windsor, Ont

Gages, Thread
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Gas, Coal Compressed
L'Air Liquide Society, Toronto, Ont.

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

Gear Blanks
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

Gear-Cutting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Gears, Cast
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Gears, Dressed
Kennedy & Sons, Wm., Owen Sound, Ont.

Gears, Forged
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

Gears, Machine Moulded
Can. Steel Foundries, Montreal, Que.

Gears, Rawhide (See Gears, Cut)
Hamilton Gear & Machine Co., Toronto Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

Gear, Silent Chain
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

Gears, Worm
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

Generators, Acetylene
L'Air Liquide Society, Toronto, Ont.

Generators, Electric
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Goggles, Safety
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

Grab Buckets
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Grease Cups, Pressed Steel and Brass
Can. Winkley Co., Ltd., Windsor, Ont.

Greases, Lubricating
Canadian SKF Co., Toronto, Ont.
Caleract Refining Co., Toronto, Ont.

Grinding Discs
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill

Grinding Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Grinding Machines, Abrasive Belt
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Bench
Aikenhead Hardware Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Geometric Tool Co., New Haven, Conn.
Goodell & Pratt Co., Greenfield, Mass.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Grinding Machines, Center
U S Electrical Tool Co., Cincinnati, O
Wisconsin Electric Co., Racine, Wis

Grinding Machines Chaser
Jones & Lamson Machine Co., Springfield, Vt

Grinding Machines, Cutter and Reamer
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Cylindrical
Garlock-Walker Mchy Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Die
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

Grinding Machines, Disc
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Drill
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Face
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Floor and Tool
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.
Wilkinson & Kompass, Hamilton, Ont.

Grinding Machines, Internal
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Manhattan Machine & Tool Works, Grand Rapids, Mich.

Grinding Machines, Portable
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Carborundum Co., Niagara Falls, N.Y.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Haskins Co., B. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Power Oscillating Tool
Herbert Ltd., Alfred, Toronto, Ont.

Grinding Machines, Ring Wheel
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Snagging
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Surface
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

Grinding Machinery, Tool Post
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Machine Co., Greenfield, Mass.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson' Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.

Grinding Wheels
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

Guards, Machinery and Window
Can. Wire & Iron Goods Co., Hamilton, Ont.

Gun-Barrel Machinery
Steinle Turret Machine Co., Madison, Wis.

Hack Saws, Power
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada
Garlock-Walker Mchy. Co., Toronto, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Lyman Tube & Supply Co., Montreal, Que.
McKenzie Machinery Co., Guelph, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Toronto, Ont.

Hammers, Drop
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Hammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Ryerson & Son, Jos. T., Chicago, Ill

Hammers, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bradley & Son, Inc., C. C., Syracuse, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

Hammers, Riveting
Cleveland Pneumatic Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

Hangers, Shafting
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hardening, Case-Hardening and Tempering
Hamilton Gear & Machine Co., Toronto, Ont.

Hardness Testing Apparatus
Shore Instrument Co., Jamaica, N.Y.

Hobbing Machines
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hobs
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Hoists, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Volta Mfg. Co., Welland, Ont.

Hoists, Hand
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Hoists, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, All Kinds
Quaker City Rubber Co., Philadelphia, Pa.

Hose, Flexible
Gutta Percha & Rubber, Toronto, Ont.

Hose, Industrial
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Hose, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

Hose, Steam, Suction, Water
Quaker City Rubber Co., Philadelphia, Pa.

Hose, Steel
International Machinery & Supply Co., Montreal, Que.

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester, Mass.

Hydraulic Machinery
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

Hydrogen
National Electro Products, Ltd., Toronto, Ont.

Index Centers
Dickow, Fred. C., Machinery Co., Chicago, Ill.

Igniters, Gas Engine
Canada Foundries & Forgings Co., Welland, Ont.

Indicators, Speed and Test
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

Insultion
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Jacks, Hydraulic
International Machinery & Supply Co., Montreal, Que.
Norton, A. O., Boston, Mass.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill
Starrett Co., L. S., Athol, Mass.
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que
Crescent Machine Co., Ltd., Montreal, Q.

Jigs and Fixtures (See Tool Work)

BUYERS' DIRECTORY

Fisher Motor Co., Ltd., Orillia, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Keyseating Machines
Bilton Machine Co., Bridgeport, Conn.
Elliott & Whitehall Tool Co., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich
Petrie, Ltd., H. W., Toronto, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Toomey Inc., Frank, Philadelphia, Pa.

Keys, Machine
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

Knives, Machine
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

Knurl Holders
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lacing Leather
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

Lamps, Electric
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

Lathe Attachments
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

Lathe Pans, Portable
Canada Machinery Corp., Galt, Ont.

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis
Hendey Machine Co., Torrington, Conn.

Lathes, Automatic and Semi-Automatic
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Bench
Archibald & Co., Chas. P., Montreal, Q
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lathes, Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Engine
Archibald & Co., Chas P., Montreal, Q
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Ministry of Munitions, London, Eng.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walker & Sons Ltd., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Extension and Gap
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich

Lathes, Heavy Duty Projectile Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Polishing (See Polishing and Buffing Machines)
Ford-Smith Machine Co., Hamilton, Ont.

Lathes, Relieving
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn
McDougall Co., Ltd., R., Galt, Ont.

Lathe, Universal Hand
Brown & Sharpe Mfg Co., Providence, R I

Lathes, Screw-Cutting
Jones & Lamson Machine Co., Springfield, Vt.

Lathe, Speed and Hand
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich

Lathes, Spinning
Terry & Co., John C., Birmingham, Eng.

Lathes, Threading
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

Lathes, Vertical Turret
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

Lathes, Wood Turning
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Lead Pipe
Steel Co. of Canada, Ltd., Hamilton, Ont.

Lighting Fixtures
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Linoleum Mill Machinery
Bertrams Ltd., Edinburgh, Scotland

Liquid Air Plants
L'Air Liquide Society, Toronto, Ont.

Lockers, Clothes
Can. Foamite Firefoam Co., Hamilton, Ont
Dennis Wire & Iron Works, London, Ont.

Lubricants
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y

Lubricating Systems
Bowser, S. F., & Co., Ltd., Toronto, Can

Machinists' Small Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Goodell & Pratt Co., Greenfield, Mass.
Ker & Goodwin Machine Co., Brantford, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Ryerson & Son, Jos. T., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Manganese Steel
Can. Steel Foundries, Montreal, Que

Mandrels, Expanding
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Mandrels, Solid
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Measuring Machines
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont

Metals, Alloy
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Metalite Cloth
Ritchey Supply Co., Toronto, Ont.

Micrometer Calipers
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Milling Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Milling Machines, Automatic
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng

Milling Machines, Bench
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Hand
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Horizontal and Planer Type
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Milling Machines, Plain
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.
Toomey Inc., Frank, Philadelphia, Pa.

Milling Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Milling Machines, Universal
Armstrong, Whitworth, of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Milling Machines, Vertical
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

Monel Metal
International Nickel Co. of Can., Ltd., Toronto, Ont.

Motors, Electric
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Moulded Rubber Goods
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Nails and Staples
Steel Co. of Canada Ltd., Hamilton, Ont

Nickel, Bars, Sheets, Wire, Etc.
International Nickel Co. of Can., Ltd., Toronto, Ont.

Nickel Plating Outfits
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Nickel Silver
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Nitrogen
L'Air Liquide Society, Toronto, Ont

Nut Tappers (See Bolt and Nut Machinery)
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished
Galt Machine Screw Co., Galt, Ont.

Nuts, S.A.E., Plain and Castellated
Galt Machine Screw Co., Galt, Ont.

Oil Filtering and Storage Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oil Storage Engineers
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oils
Canadian Oil Companies, Ltd., Toronto, Ont
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers
Can. Winkley Co., Ltd., Windsor, Ont.

Oils, Soluble
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Stones
Carborundum Co., Niagara Falls, N.Y.

Oxygen
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont
L'Air Liquide Society, Toronto, Ont.

Oxy-Acetylene Apparatus
L'Air Liquide Society, Toronto, Ont.

Packing, Hydraulic
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, L., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

Packing, Rod and Steam
Quaker City Rubber Co., Philadelphia, Pa

Packing, Steam
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

Paper Mill Conveyors
Bertrams Ltd., Edinburgh, Scotland

Patents
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

Pans, Wet and Dry
Frost Mfg. Co., Chicago, Ill.

Pattern-Shop Machinery (See Woodworking Machinery)
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich

Patterns, Wood and Metal
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

Penstocks, Steel
MacKinnon Steel Co., Sherbrooke, Que.

BUYERS' DIRECTORY

Phosphor Tin
British Smelting & Refining Co., Ltd., Montreal, Que.

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pig Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Bending Machines
American Pipe Bending Machine Co., Boston, Mass.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Pipe Couplings
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Cutting and Threading Machines
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa.

Piston-Ring Machines
National Acme Co., Cleveland, Ohio
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg. Co., Niagara Falls, Ont.

Planing Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Pneumatic Tools
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
International Machinery & Supply Co., Montreal, Que.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Polishing and Buffing Machines
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Pressed Steel Parts
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich.
Niagara Machine & Tool Works, Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Niagara Machine & Tool Works, Buffalo, N.Y.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

Presses, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Screw
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Protractors
Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers
Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

Pulleys, Metal and Fibre
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Pulp and Paper Mill Equipment
MacKinnon Steel Co., Sherbrooke, Que.

Pumps, Automobile Tire
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Pumps, Barrel and Boiler-feed
Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coalant
Trahern Pump Co., Rockford, Ill.

Pumps, Geared and Hand
Trahern Pump Co., Rockford, Ill.

Pumps, Industrial
Trahern Pump Co., Rockford, Ill.

Pumps, Hydraulic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

Pumps, Power
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

Punches, Center
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

Punches, Power
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, Ohio

Punching Machines, Horizontal
Bertrams Ltd., Edinburgh, Scotland.

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Racks, Cut
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

Racks, Storage (See Furniture, Machine Shop)
Brantford Oven & Rack Co., Brantford, Ont.

Rammers, Foundry
Holden Co., Ltd., Montreal, Que

Reamer Holders
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

Reamers, Expanding
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reamers, Solid
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reamers, Taper
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Recorders, Temperature
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Recorders, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Regulators, Automatic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Rheostats
Northern Electric Co., Montreal, Que.

Resistance Materials
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Respirators
Willson Goggles, Inc., Reading, Pa.

Rivets
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Rivet Heaters
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.
Ryerson & Son, Jos. T., Chicago, Ill.

Riveting Machines
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment
Stewart & Co., Duncan, Glasgow, Scot.

Rolls (Rubber Covered)
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Rudder Frames, Steel
Can. Steel Foundries, Montreal, Que.

Rubber Goods, Mechanical
Quaker City Rubber Co., Philadelphia, Pa.

Rules, Steel
Chesterman & Co., Ltd., J., Sheffield, Eng.

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence, R.I.

Rust Preventatives
Oakley Chemical Co., New York, N.Y.

Sand Paper
Wausau Abrasives Co., Chicago, Ill.

Sand Equipment
Can. Link-Belt Co., Toronto, Ont.

Sand Mills
Frost Mfg. Co., Chicago, Ill.

Sanding Machinery
Oliver Machy. Co., Grand Rapids, Mich.

Sand Rammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Saw Frames and Blades, Hack
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

Sawing Machines, Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ryerson & Son, Jos. T., Chicago, Ill.

Sawing Machines, Power Hack
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Saw Sharpening Machines
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saw Tables, Universal
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
McKenzie Machinery Co., Guelph, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Saws, Circular Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

Saws, Hot and Cold
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Saws, High Speed Steel
Armstrong Whitworth of Canada Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Metal Band
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saws, Metal, Power
Clemson Bros., Inc., Hamilton, Ont.

Saws, Metal Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

Saws, Milling
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada Ltd., Dundas, Ont.

Saws, Screw Slotting
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Swing Cut-off
Oliver Machinery Co., Grand Rapids, Mich.

Scales
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

Screens
Can. Wire & Iron Goods Co., Hamilton, Ont.

Screw Driving Machine
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Screw Extractors
Cleveland Twist Drill Co., Cleveland, O.

BUYERS' DIRECTORY

Screw Machine Work
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont

Screw Machinery, Wood and Lag
Cook Co., Asa S., Hartford, Conn.

Screw Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Screw Machines, Automatic
Gerlock Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont
National Acme Co., Cleveland, Ohio.

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

Screw Plates
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Screws, Cap and Set
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Screws, Machine
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont

Screws, Safety Set
Barnes Co., Wallace, Bristol, Conn
Galt Machine Screw Co., Galt, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Second-Hand Machinery
(See Searchlight Section)
Pedlar, Ltd., H. W., Toronto, Ont

Separators, Moisture and Oil
Bowser, S. F. & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Separators, Oil and Waste
Bowser, S. F. & Co., Ltd., Toronto, Can.

Shafting
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont

Shaping Machines
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Toomey Inc., Frank, Philadelphia, Pa.
Walcott Lathe Co., Jackson, Mich
Williams Machinery Co., A. R., Toronto, Ont.

Shapers, Wood
Oliver Machinery Co., Grand Rapids, Mich.

Shears, Hand
Can. Blower & Forge Co., Ltd., Kitchener.

Shears, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

Shearing Machines, Angle, Iron Bar and Gate
Bertram, Ltd., Edinburgh, Scotland

Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

Sheets, Nickel, Resist. Alloy
International Nickel Co. of Can., Ltd., Toronto, Ont.

Sheets, Nickel, Monel and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Side Frames, Locomotive
Car Steel Foundries, Montreal, Que

Slotting Attachments
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio

Slotting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

Soldering
British Smelting & Refining Co., Ltd., Montreal, Que
Hoyt Metal Co., Toronto, Canada

Snap Flasks
Oliver Machy. Co., Grand Rapids, Mich

Special Machinery and Tools
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio

Spectacles, Industrial
Willson Goggles, Inc., Reading, Pa.

Springs
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

Sprockets and Chains
Can. Link Belt Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Squares
Brown & Sharpe Mfg. Co., Providence, R.I.

Stamping, Metal
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn
Diamond Saw & Stamping Works, Buffalo, N.Y.
Elliott & Whitehall Tool Co., Galt, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
Diamond Saw & Stamping Works, Buffalo, N.Y.

Stairways, Wrought Iron
Can. Wire & Iron Goods Co., Hamilton, Ont.

Steam Specialties
Crane Ltd., Montreal, Que.

Steel Plate
Dom. Foundries & Steel, Hamilton, Ont.

Steels, Tool
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa

Steel Blooms and Billets
Steel Co. of Canada, Ltd., Hamilton, Ont

Steel, Cold-Rolled Strip
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q

Steel Castings
Dom. Foundries & Steel, Hamilton, Ont.

Steel Forgings
Dominion Foundries & Steel, Ltd., Hamilton Ont.

Steel, Shafting and Free Cutting Screw
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

Steel, Sheet
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

Steel, Tanks
Can. John Wood Mfg. Co., Toronto, Ont.

Steel, Stainless
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel Wire Rods
Steel Co. of Canada, Ltd., Hamilton, Ont

Steels, Alloy, Open Hearth and Electric
United Alloy Steel Corp., Canton, Ohio

Steels, Alloy and Carbon
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que
Dom. Foundries & Steel, Hamilton, Ont
Firth & Sons, Ltd., Thos., Montreal, Q
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steels, High-Speed
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel, Magnet
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel, Structural
MacKinnon Steel Co., Sherbrooke, Que.

Steel Tubing, Close Joint and Welded
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

Stern Frames, Cast Steel
Can. Steel Foundries, Montreal, Que

Stools, Shop
Ministry of Munitions, London, Eng

Straightening Machinery
Bertrams Ltd., Edinburgh, Scotland.
Ryerson & Son, Jos. T., Chicago, Ill

Studs
Galt Machine Screw Co., Galt, Ont.

Surface Plates
Bilton Machine Co., Bridgeport, Conn.

Swaging Machines
Atkins & Co., Inc., E. C., Indianapolis, I

Switches, Railway
Can. Steel Foundries, Montreal, Que.

Switches and Switchboards
Northern Electric Co., Montreal, Que.

Tablets, Bronze, Memorial
Tallman Brass & Metal, Ltd., Hamilton, Ont

Tachometers
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

Tanks, Steel
MacKinnon Steel Co., Sherbrooke, Que
Can. John Wood Mfg. Co., Ltd., Toronto, Ont

Tanks and Pumps, Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

Taper Cutting Dies
Jones & Lamson Machine Co., Springfield, Vt

Tap Holders
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taper Pins
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Tapes, Measuring
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass

Tapping Machines and Attachments
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Cincinnati, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Taps and Dies
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Merrow Taper Die & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont.

Taps, Collapsing
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Modern Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio
Victor Tool Co., Waynesboro, Pa.

Teeth, Dredge Bucket
Kennedy & Sons, Wm., Owen Sound, Ont

Testing Metals and Materials
Toronto Testing Laboratory, Toronto, Ont.

Thermometers
Bristol Co., Waterbury, Conn

Thread-Cutting Tools
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Thread Cutting Machines
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

Threading Machines
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Thread Lead Testing Machines
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Thread-Rolling Machines
Bliss Co., E. W., Brooklyn, N.Y.

Tongs
Hepburn Ltd., John T., Toronto, Ont.

Tool Cases
Rice Lewis & Son, Ltd., Toronto, Ont.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Markers, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Tool Posts, Lathe
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Steels for all Purposes
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Tools, Small (See Machinists' Small Tools)
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que
Chesterman & Co., Ltd., J., Sheffield, Eng.
Elliott & Whitehall Tool Co., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Starrett Co., L. S., Athol, Mass
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Tool Work
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

Torches, Blow
Can. Hauck Burner Co., Port Hope, Ont.
International Machinery & Supply Co., Montreal, Que.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont
Rice Lewis & Son, Ltd., Toronto, Ont.

Trackwork, Railway
Car Steel Foundries, Montreal, Que

Trackwork, Manganese Steel
Can. Steel Foundries, Montreal, Que

Transformers
Northern Electric Co., Montreal, Que

Transmission Machinery
Bowser Industrial Co., Walkerville, Que
Can. Link Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Jones & Glassco, Montreal, Que
Kennedy & Sons, Wm., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que.

BUYERS' DIRECTORY

Transportation Systems (See Trucks)
Mathews Gravity Carrier Co., Port Hope, Ont.

Treated Bits
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa

Trolleys and Tramways
Can Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Trucks
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cowan Truck Co. (R. B. Smiley), Toronto, Ont.
Diamond State Fibre Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

Trucks, Industrial Motor
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
National Steel Car Corp., Ltd., Hamilton, Ont.

Tube, Products
Tube Co. of Canada, Toronto, Ont.

Tubing, Electric Welded or Oxy-Acetylene Welded
Tube Co. of Canada, Toronto, Ont.

Tubing, Flexible
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Tubing, Seamless Steel
Tube Co. of Canada, Toronto, Ont.

Tubing, Seamless Steel, Brass and Copper and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Tubing, Welded
International Nickel Co. of Can., Ltd., Toronto, Ont.

Tubing, Welded Steel
Tube Co. of Canada, Toronto, Ont.

Turbines, Water
Kennedy & Sons, Wm., Owen Sound, Ont.

Turret Heads
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Turret Machines (See Lathes, Horizontal Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Turrets, Tool Post
Gisholt Machine Co., Madison, Wis.

Unions, Pipe
Crane Ltd., Montreal, Que.

Universal Joints
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Valves
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.

Valves, Rubber Pump
Quaker City Rubber Co., Philadelphia, Pa

Vises, Drilling Machine
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

Vises, Metal Workers'
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O

Vises, Milling Machine
Brown & Sharpe Mfg. Co., Providence, R.I
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.

Vises, Pipe
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

Vises, Planer and Shaper
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont
Superior Machine Co., London, Ont.

Vises, Wood Workers'
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy Co., Grand Rapids, Mich
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

Washers, Rubber
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Welding Apparatus, Oxy-Acetylene
L'Air Liquide Society, Toronto, Ont.

Welding, Electric
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

Voltmeters
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

Wagon Loaders
Can. Link-Belt Co., Toronto, Ont.

Washers
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Welding Filler Rods
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding Machines, Oxy-Acetylene
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding, Oxy-Acetylene
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Welding Rod, Tobin, Manganese Bronze and Aluminum
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Welding Supplies
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Wheels, Industrial
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Electric
Volta Mfg. Co., Welland, Ont

Winches, Headgate
Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Stoplog
Kennedy & Sons, Wm., Owen Sound, Ont.

Wire
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

Wire Cloth
Can Wire & Iron Goods Co., Hamilton, Ont.

Wire Rope
Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Straightening and Cutting Machinery
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Schuster Co., F. B., New Haven, Conn.

Wire, Welding
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Wires, Special
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Woodworking Machinery
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Wrenches, Drop Forged
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Machinists'
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Pipe
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

Wrenches, Tap
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.

Wrought Iron Pipe
Steel Co of Canada, Ltd., Hamilton, Ont

Over seven pages printed here each week for your convenience

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Measuring Tapes, Steel Rules, Straight Edges, Surveyors' Band Chains, Engineers' Tools

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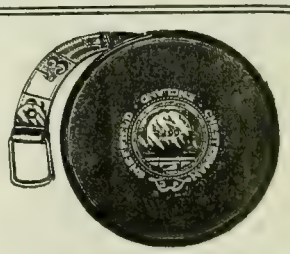

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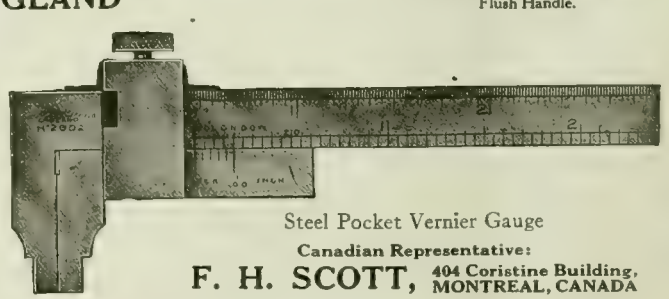

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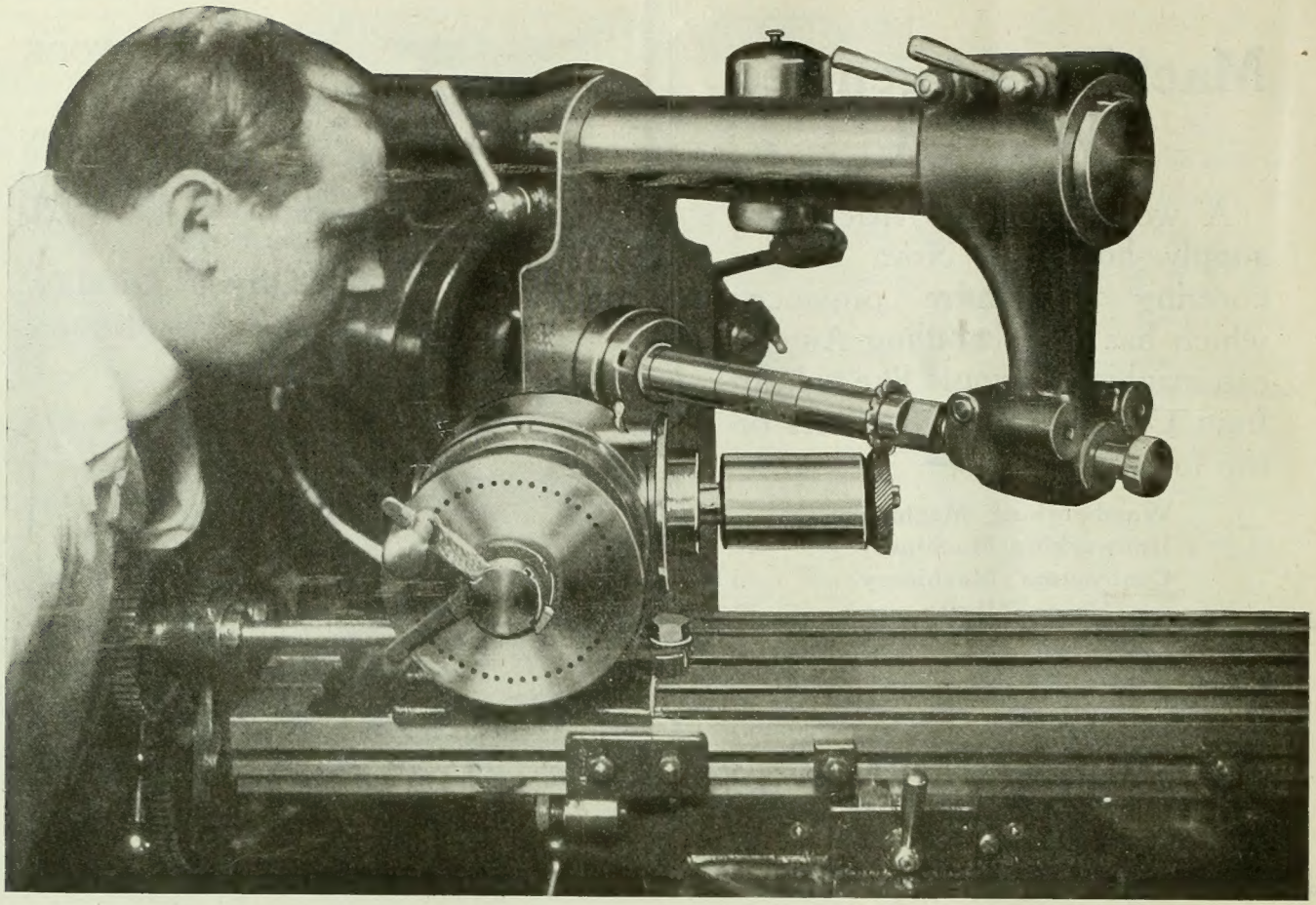

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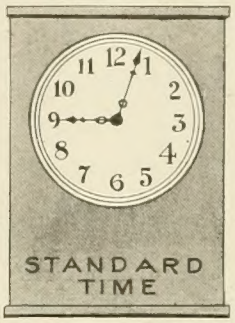

When business men wish to keep an appointment they set their watches by the same standard clock. They will then be sure to meet without wasting any valuable time. Not only would a business man be at a loss without his watch, but unless he had a standard by which to keep that watch accurate, he would be greatly handicapped throughout his busy day.

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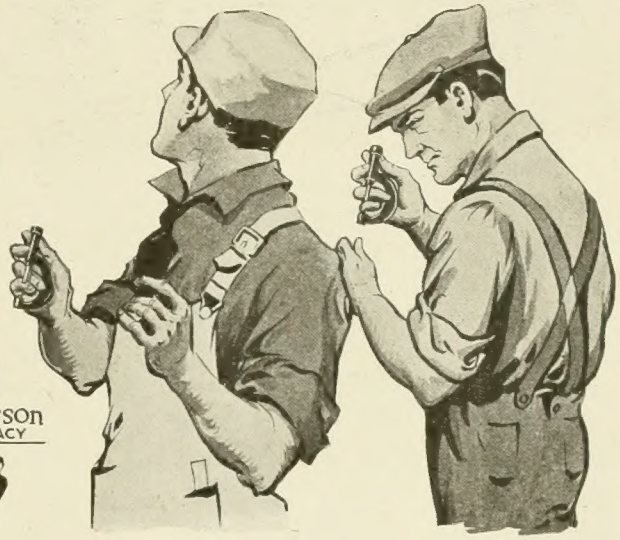

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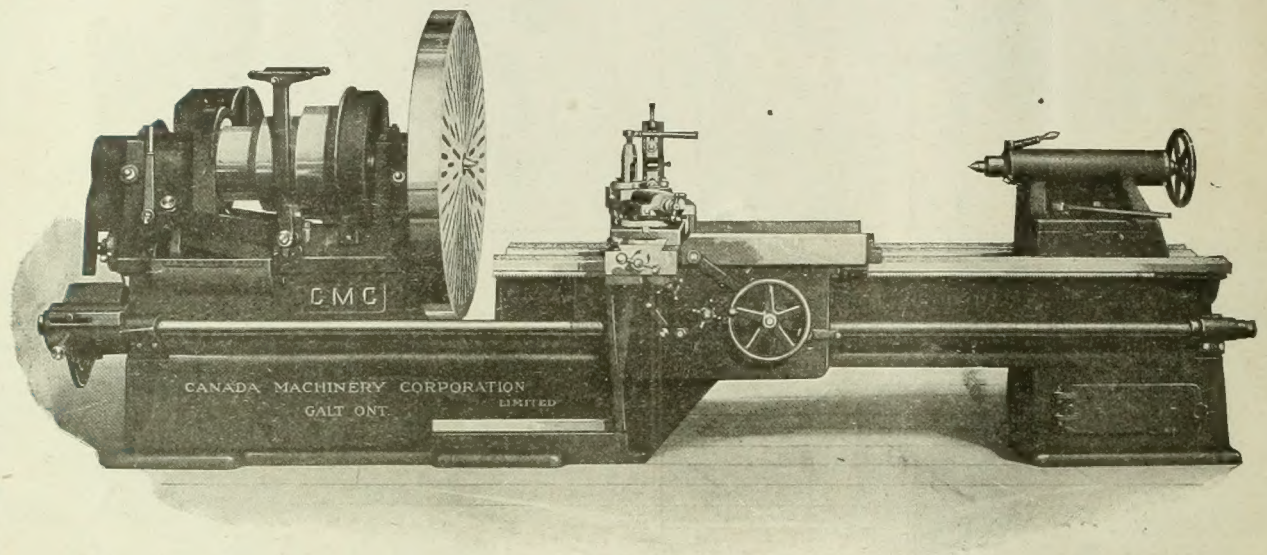

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